

GULLWING

Magazine

Spring 2004
Volume 2 Issue 2



*B.A.E. TURBO INSTALL
WORLD OF WHEELS
REARVIEW CAMERA
FEATURE/COVER CAR*

*CV JOINT MAINTENANCE
CLUTCH SAFETY SWITCH
INDIGLOW DASH INSTALL
DOOR WHATCHAMACALLITS*



Wings-A-Loft™

"Remote Door Opening System"



Custom Wheel Adapters/Spacers

DeLorean Parts Northwest is now offering custom wheel adapters and spacers that feature a hub-centric design for safety and vibration-free performance. Our hub-centric spacers can be safely used up to 15 mm with the addition of high-strength longer studs. For those of you who are a bit more radical, our hub-centric adapters can be made from 25 mm, and up to 50 mm thick, and you don't need to change the studs.

To ensure optimum safety and reliability, these custom-made spacers and adapters are made from the finest forged aluminum rings for the utmost in strength and durability.

K1008DP Spacers* from \$139.95 + freight
K1009DP Adapters* from \$159.95 + freight

*Custom made to your specifications, priced per pair.

Wings-A-Loft™

DeLorean Parts Northwest is proud to announce the Wings-A-Loft line of Remote Door Opening Systems, with a heritage of years of reliability. These systems are easy to install using normal tools, and come with heavy-duty linear actuators that are proven in service, custom-made linkage, relays with pre-wired sockets, detailed instructions, and most of the electrical supplies and hardware that you will need to install these remarkable systems. There is nothing quite like the look on a person's face when the doors of a nearby DeLorean open up in a graceful arch, without any apparent human intervention.

Why wait? These systems are available for you to enjoy right now!

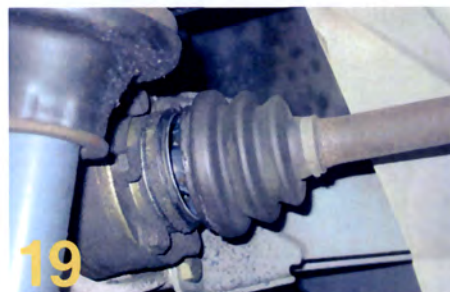
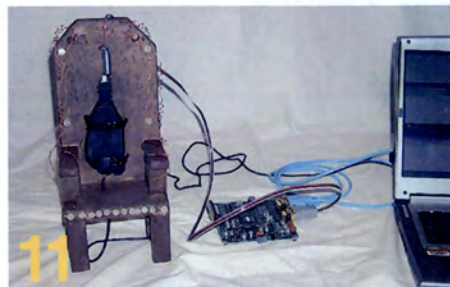
K1001DP Wings-A-Loft \$199.95 + freight
K1002DP Wings-A-Loft w/Alarm \$249.95

1-877-399-0171 PARTS@DELOREAN-PARTS.COM WWW.DELOREAN-PARTS.COM



CONTENTS

Spring 2004
Volume 2 Issue 2



Features:

3 **BTTF Baby Room...**
An early start at time travel dreams

5 **Indiglow Dash Install...**
Yellow Project D gets new dash

9 **Safety Switch Mod...**
Ever start your car in gear?

11 **Whatchamacallits...**
Launcher, opener, popper???

16 **World of Wheels...**
Ds & Rock Crawler display a hit

19 **She Bangs, She Bangs...**
CV joint repair & replacement

25 **Cover/Feature Car...**
Stainless Steel Reality check

35 **Turbos!!!...**
The last new B.A.E. Turbo?

43 **"D" TV...**
Rearview TV & sound system

ON THE COVER
Photo Illustration by:
Raymond C. Parrish

Source: The sky is a public-domain shot from NOAA, the National Oceanic and Atmospheric Administration.

<http://www.photolib.noaa.gov/>

It's a Boy!

Congratulations to Ken Costa and Laura Ellis on the birth of their new son, born on March 11, 2004.

Nicholas Antonio Costa

arrived at 1:26 p.m.,
weighing 7 lbs. 2.5 oz.,
and 19.5 inches long.

Wow!

Check out the awesome "Back to the Future" baby room...



Thanks to the vision of your Daddy to make the closet doors into the clock tower, and the artistic talents of your Mommy, you have a very cool new bedroom Nicholas. Your parents are a true inspiration!



GULLWING

Magazine

Spring 2004
Volume 2 Issue 2

PUBLISHER

Ron Wester

MANAGING EDITOR

Cheryl Wester

ADVERTISING MANAGER

Ron Wester

CONTRIBUTING WRITERS

Dominique Flandin
David Jacobs
Joe Kuchan
Marty Maier
Ray Parrish
Mark Valuch
Cheryl Wester
Ron Wester

CONTRIBUTING PHOTOGRAPHERS

Danny Botkin
Ken Costa & Laura Ellis
Dominique Flandin
Rob George
David Jacobs
Joe Kuchan
Ray Parrish
Cheryl Wester
Ron Wester

PARTICIPATING ADVERTISERS

DeLorean Midwest Connection
(Don Gowler)

DeLorean Motor Center
(Don Steger)

DeLorean Motor Company
(Stephen Wynne)

DeLorean Parts NorthWest
(Toby & Misty Peterson)

Pearce Design Components
(Bryan Pearce)

P.J. Grady
(Rob Grady)

Special T Auto
(John Hervey)

GULLWING Magazine (ISSN 1544-8347) is published quarterly (4 times yearly). Postal address: P.O. Box 991, St. Peters, MO 63376 U.S.A. GullwingMagazine@juno.com. The buyer purchasing this magazine understands that all contents, facts, opinions, and statements appearing within this publication are those presented from writers and contributors, and are in no way to be construed as endorsements by GULLWING Magazine or its representatives. Information in GULLWING Magazine is gathered from various sources considered to be reliable, but the accuracy, completeness, and legality of all information cannot be guaranteed, therefore, GULLWING Magazine holds no responsibility for damages as a result of incorrect, misuse, or misunderstanding of information, and offers no warranty of contents. Copyright© 2004 and all rights reserved by GULLWING Magazine. No material may be reproduced in whole or in part without prior permission.

Printed in USA



Ron Wester

FROM THE PUBLISHER'S DESK

This issue has some interesting articles written by some "D" owners that really give it 110%! With each and every issue, I discover more and more DeLorean owners out there who don't follow the DeLorean Mailing List on the net, but have been looking for an outlet to showcase their personal efforts in customizing their own "D". Gullwing Magazine will be bringing some amazing cars and owner's stories to you with every new issue.

I am constantly encouraged by the movement of owners that have started doing a bit of customizing/personalizing of their DeLoreans. Along with this group, is a whole new group of younger buyers that are discovering the DeLorean on a daily basis. These younger owners are bringing some of the excitement of the import "tuners" to the world of DeLoreans. I'm sure that as time passes, we will see some wild DeLorean creations. Some of these you will enjoy, and some, well... some will just be out there for your entertainment.

I think a good indication of what is to come is the direction the vendors are going in the development of aftermarket parts. Every month that passes seems to bring some new and long awaited aftermarket goodies to the marque. Let's enjoy it, it's been a long time coming.

We will be bringing some special things to Pigeon Forge for all of you to see. Please have a safe trip to the show and be sure to visit all of the vendors.



Cheryl Wester

FROM THE EDITOR'S DESK

It's apparent that we continue to have many talented writers that enthusiastically contribute articles for Gullwing. I realize the amount of time it takes to put thoughts into words for each article, and am impressed with all of the additional little "extras" that compliment the text so well.

I'm truly amazed by all of the effort put forth in these articles that help to visualize these stories. (Sometimes I feel like I'm right there while reading these stories, and other times I think that some people have way too much time on their hands!) The talents (and humor) of our generous writers are greatly appreciated, and we hope you enjoy their work as much as we do.

This month (May), I had a great Mother's Day. I'm a proud Mom, and also had a nice visit with my Mother. I hope you had a similar experience with your Mom or mother of your children for this special occasion.

Next month (June), I'll be looking forward to seeing/meeting many of you on Father's Day weekend in Pigeon Forge, and hope all of the Dads will be having a great time!

In July (25th and 26th), we plan to participate at the custom California Autofest show that's being cosponsored by DMC Houston, and hope you will consider attending as well. Please check out their website for additional information at www.californiaautofest.com.

Enjoy this issue, and have a completely great read!



INDIGLO DASH

Technical and photos by: Ron Wester

The illumination and readability of the DeLorean dash leaves a bit to be desired. Okay, it leaves a lot to be desired! At night, you can find yourself staring at the gauges too long to get a reading while you should be getting your eyes back on the road. What can be done about this lack of visibility in a very important area that supports the driving experience? Well, outside of changing the gauges and customizing the entire dash, or going with digital gauges, you can install the Indiglow Dash Kit from D.A.R.T. (DeLorean Automotive Racing Technology).

We recently ordered the Indiglow Dash from Ryan Gould of D.A.R.T. for installation on our Yellow Project DeLorean.

During a recent get together of the Mid-State DeLorean group, the Indiglow Dash kit was installed. It comes in handy to have a few extra experienced D owners available when you are doing a project in one of those areas you may not have had a lot of experience in.

The Indiglow Kit (Figure 1) is complete with everything you need to do the job. Our kit came with four ElGlo panels, inverter box, Bosch relay, colored bulbs, and scotch locks. Also included were a pretty decent set of instructions.

Probably the most difficult part of this project is getting under the dash on the driver's side. This problem can be compounded greatly if you are weight challenged like I am. Removing four bolts to get the seat out of the way would have been easy, but I decided to suck it up, literally, and go for it.

The first thing you need to do is remove the hard plastic vent tube and flex tube (Figure 2) that runs just above the steering column.

Next up is to remove the six nuts (Figure 3) holding the binnacle to the dash. After you have removed these nuts, you should be able to lift the binnacle enough to reach the two harness plugs and speedometer cable. To release the speedo cable, press the retaining clip (Figure 4) that holds the cable to the speedometer and it will release. Each harness has a plug (Figure 5) that can be released by compressing the ears.

Remove the gauges from the binnacle by taking out the screws from the backside. (Figures 6 & 7)

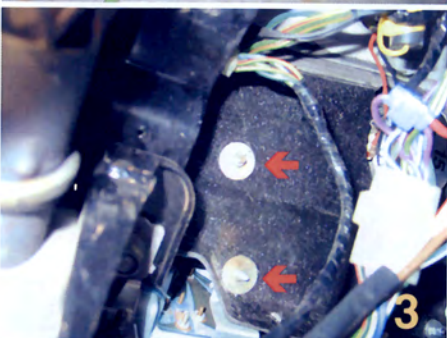
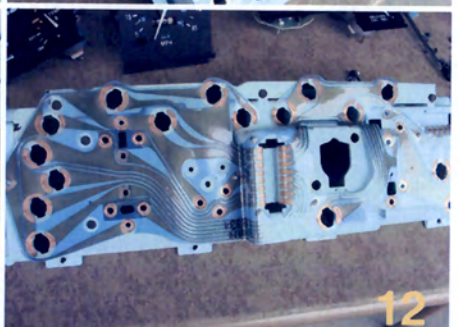
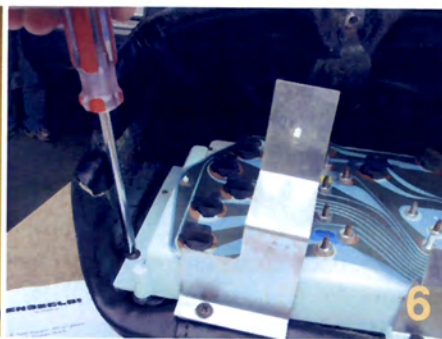
The clear gauge cover is removed by taking out the screws holding it to the gauge panel (Figure 8) and removing the trip reset button. You will need an extremely small flat-blade screwdriver (Figure 9) to remove the screw inside the trip reset button.

Gauges can be removed by taking off the bolts (Figure 10) that are circled in red. The gauges only come off in one way, so make note of the order, because they only go back together (Figure 11) in the same way reversed. This is also a great opportunity to use Tarn-X on all of the connections to remove the years of grime and buildup. You might as well go ahead and replace bulbs (Figure 12) while you're in there. The bulbs in the green sockets (Figure 13) can be replaced with red, orange, blue, or your color choice of bulb for lighting up the gauge needles. We found that the darker colors are harder to see during nighttime driving on this particular dark-colored overlay.

The actual Indiglow overlays just slide underneath the existing gauge needles (Figure 14) and can be held into place with the double-sided tape that is provided, or can be glued into place. We chose the double-sided tape, and it worked great on the dash gauges, but wouldn't stick to the A/C panel. For the A/C panel, we used 3M Trim Adhesive.

The two gauges on the ends must be reinstalled (Figure 15) before attempting the tach and speedo overlay in the center.

What is interesting about the overlay for the tach and speedo, is that you are trying to put a one-piece overlay



onto two separate gauges. I decided to mount the gauges in the panel and install the overlay (Figure 16) while they were mounted. Once the overlay was in position, I used a small screwdriver to lift the backing on the double-sided tape and stick down one side of the overlay at a time.

If your trip reset button is broken off, the install of the overlay is no big deal. If your reset button is intact, then it needs to be removed. Unfortunately, this is probably much farther into the speedo unit than the average DeLorean owner wants to go. I would suggest slitting the overlay to get it on around the reset button. Keep in mind the tape is very sticky, and once you place the overlay on, it stays put.

In my case, the trip reset button was nearly broken off, so it was easier to pull it off the rest of the way than to try to access it from the inside of the speedo unit.

The one thing I kept telling myself as I went through this install was to "have patience". If you take your time, the end result (Figure 17) is worth the trouble.

At this point, just reverse the steps for taking apart the binnacle (Figure 18) and get it ready to reinstall on the dash. Run the wires for the Indiglow unit behind the knee bolsters (Figure 19) and set the binnacle into place, but do not bolt it down.

Next, (Figure 20) is to remove the A/C panel. After you have the panel removed, take out the top four bulbs (Figure 21) that normally illuminate the panel. Pull the wiring from behind the console (Figure 22), and pick out the red and black wires. Attach the power inverter to the red and black wires using the Scotchlocks, and plug in the Indiglow panels to the inverter's wiring harness. The harness has a dimmer

wired in to control the Indiglow light, and your stock rheostat will still be used to control the lights that illuminate the needles. I had to use 3M Adhesive to mount the overlay to the A/C panel since the double-sided tape didn't seem to want to adhere to the material the A/C panel is made of. I didn't mount the Indiglow dimmer switch at this time, so I wrapped some tape around it to prevent shorts and stuffed it behind the console.

The kit also comes with an updated relay that replaces the original relay for the A/C panel lights, or the jumper wire if you've done the "update." This relay allows the A/C panel lights to turn on with the headlamps instead of the ignition.

TURN IT ON! If everything works, reinstall the HVAC panel and the binnacle. The end result is dramatic! Now you can read the background at a glance. You may want to experiment with different colored bulbs to light up the needles.

To get your kit, contact Ryan Gould at rgould@deloreanautomotive.com.



BEFORE INDIGLOW



...INDIGLOW



CLUTCH SAFETY SWITCH

a.k.a. Garage Door Saver

Article adapted by: Mark Valuch

Photos by: Rob George



Have you ever done anything similar to this?

If you've ever attempted to reach into your car and just turn the key, thinking it was in neutral, this easy modification will prevent you from starting the car unless you're pushing the clutch pedal down a little. This way, you have to think about it before you start the car and it drives off through the garage door. Hopefully, this information will save a few garage doors from

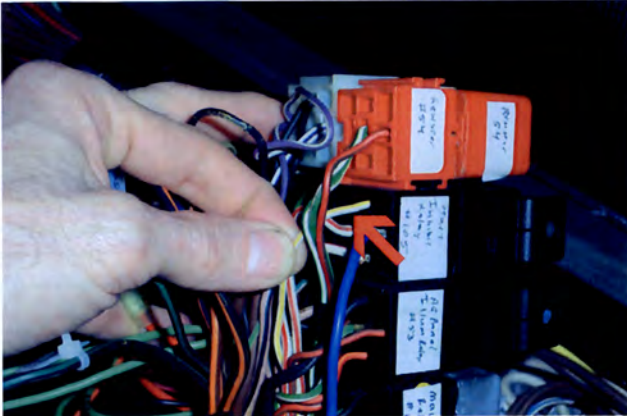
damage due to cars taking off without a driver.

We've all done something similar to this at least once, however, if you've ever attempted to exit the car while it was running, thinking it was in neutral with the parking brake on, or you own an automatic transmission... you're on your own!

This modification can be easily reversed to make the car stock again.

Refer to DeLorean Workshop Manual page M:18:01 and the DeLorean Wiring diagram (single sheet). The wiring diagram lists the Start Inhibit Relay as number 105 and location 9D.

Part #4 (Neutral Start Switch) in the workshop manual is what we will be replacing. There is a white and yellow wire that leaves the socket and heads toward the transmission. (In the photo, my socket was rewired by a previous owner. It was not causing any problems,



so I left it. Also, there are two relays missing for the fan fail circuit which was replaced with a separate circuit. In other words, your wiring will look different, but grab that white and yellow wire anyway.)

That wire goes up the wiring harness and out to the red connector inside the engine compartment. It just loops out of the red connector and goes back in, as shown in the photo below. If you follow it back inside the car, it goes to ground as shown on page M:18:01. If you unplug the red connector, the car will not crank. The green wires in that red plug go to the transmission reverse switch for the back up lights. (If you ground that white and yellow wire at one of the ground points, you can crank the car. That yellow wire just has to be grounded somewhere.)



Cut that white and yellow wire off in the wiring harness at about the location shown in the picture below, and pull it back through the other way under the junk tray in the center console between the seats. Attach another long wire to it. (I happened to use red.)



Follow the wiring harness with the red wire all the way over to the switch. You can see the red wire at the top left and bottom right of the picture below. The switch is a spare brake light switch.



From the switch, run another wire back up along the red wire, and then down the harness for the inertia switch. There is a big black heavy ground wire that comes down to the inertia switch. I spliced into it right under the service counter. You can see a thicker area in the cable at that point.

I then wrapped the entire visible cable with tape to hide my modifications (including the area by the air plenum).

The piece of metal holding the switch in place is 1/16" thick sheet steel left over from my frame restoration. I wish I had made it wider and bent the edges down a bit so it would not twist. If it does, I will make another. The screw was already there for adjusting the pedal height.

That's all there is to it. Do this modification at your own risk. ~🔧

Door Whatchamacallits...

Article and photos by: David Jacobs



You know those things that auto-magically open, launch, pop, aloft, explode, implode, whatever or however they do it or call it, your doors? Well, I was fudging a report at work one day when I decided to install an alarm system in my car, and furthermore concluded that it might be an ideal time to also get an auto door opening kit installed as well. It was decided then and there that I would stop wasting my time writing that report my boss wanted, and began to draft a list of what I wanted in an alarm system, and what I expected from an auto door opener kit.

1. It should open my doors via remote... and I should be able to choose one or both doors to open.
2. It should be reasonably priced.
3. It should be relatively easy to install... not in the mood for rocket science, and I don't want to spend a lot of time on it. Just because I am a weekend warrior, doesn't mean I should spend my WHOLE weekend installing it.
4. The product should be well built and not a hack job of cheap parts. That includes the instructions - they should be written specifically for the DeLorean and should be cookbook style: straightforward and easy to understand.
5. It shouldn't compromise my DeLorean in its current functionality, such as making the doors heavier or preventing the stock door locking mechanism from working.
6. I want the alarm to do more than annoy people within listening distance when the alarm is triggered. We all know that familiar screaming car ballad. Does it really do anything useful?

7. And most importantly, I don't want to wait any longer. The product should be available now.

So began my search for a door opener kit from one of our esteemed vendors. Just a short amount of time surfing on the company dime revealed that, at the time I was looking for a unit, only ONE vendor had a kit readily available for sale! Well, so much for choice, looks like the decision was made. Yes, I could have built my own setup, but I wanted something packaged and ready to go without me trying to figure out how to put all the odds and ends together. By purchasing a pre-done ready-to-go package, I am saving time and hair (by not ripping it out), and in some cases money.

The only prepackaged ready-to-go option available is "Wings-A-Loft™" provided by DeLorean Parts Northwest. Now I have heard and read quite a bit about the door opener kit DPNW was selling. A search on the DML revealed nothing but praise by those who actually purchased a unit. A quick e-mail to DeLorean Parts Northwest, and the next thing I know I'm installing it into my car.

When I got the kit, I immediately went for the "bling bling" which was of course, the remote key chain. My brain immediately responded to the sight of the remote and "sweeeeeeet" was the only thing coming out of my pie hole. It wasn't another boring remote with a couple of buttons, it was techno lights and rock and roll wrapped up in a little bling I could attach my key to. My favorite part of the remote is the little blue LED on the top - it flashes with every push of any button. It also, with the touch of a side button, can be used as a mini-light for emergencies when you need to quickly blind your friend in the eye for being a smartass. Oh,

and it's good for finding stuff you dropped in the car or on the ground when it's dark outside. (Figure 1)

The brain was much smaller than I anticipated. It is a neat little package that can be easily tucked behind the DeLorean fuse panel. (Figure 2)

DPNW's Wings-A-Loft™ package came with door actuators and not solenoids. And for those of you who don't know the difference, solenoids are, in their most basic form, an electromagnet that pushes or pulls on a metal core cylindrical rod. They are usually pretty heavy and draw more amperage because they require large copper wound coils that create a magnetic polarity that pushes or pulls on the cylindrical rod. Also, solenoids are usually more robust than actuators since they are typically all metal and have only one moving part... the rod. Our little DeLorean's door locks are solenoids.

Actuators are a wee bit different. In the case of the actuators that come with the Wings-A-Loft™ kit, they pull less amperage than the

DeLorean solenoids simply because they use a smaller electro motor. The use of gears in the actuator allows a smaller motor to do the job of a larger direct drive motor such as the solenoid. So you have a motor that spins a set of gears that spins a screw that pulls down or pushes up a lever. Depending on what the gears are made of (plastic, nylon, metal, etc.) the weight of an actuator can vary. DPNW's actuators are extremely lightweight considering their 12 lbs. of pull/push power. DPNW's actuators weigh in at only 7 ounces with the mounting plate, and their measurements are width=2.25", length=4.25", and thickness=1". (Figure 3)

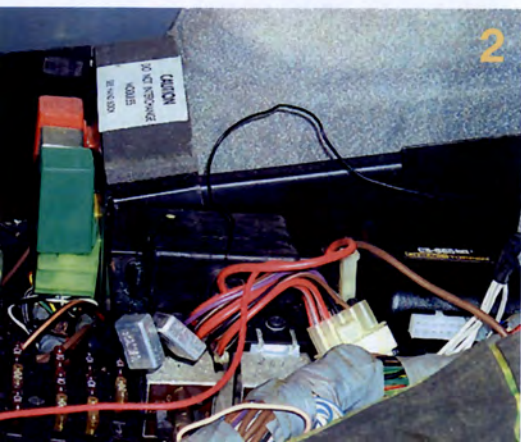
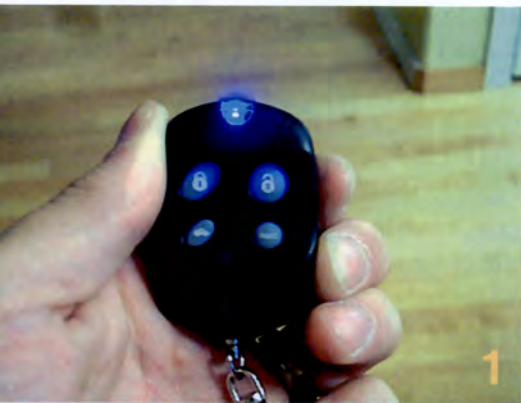
You must be thinking at this point that the actuators are going to have a very limited life span. Plastic parts and gears? Little motor? Well, I wondered the same thing. Let's face it, the door mechanisms inside the DeLorean door are tight and require some serious pull for both latches. So how 'bout we get medieval with a scientific flare on these actuators?

So in the name of science, I built my actuator torture chair. (Figure 4)

This little science experiment has 11.5 lbs. of spring loaded resistance attached to a lever which I have hooked the actuator onto. Strapped into the chair, the actuator is

controlled by a timer chip that activates the actuator with 12 volts every 5 seconds. Every time the actuator successfully pulls down the 11.5 lbs. of pressure on the lever, it releases pressure to a monetary switch that sends a signal to a computer program (that I quickly whipped up) which records the test results. The computer program monitors the time and knows that the actuator needs to signal it every 5 seconds (+/- 1 second). Should the actuator miss a beat, it will be recorded on the program. The program monitors time passed, and each pull from the actuator. I was also going to add a thermal monitor to measure how much heat the actuator generated over time, but I ran out of time and decided it really wasn't that important. A typical owner isn't going to put enough stress or constant use on the actuators to generate any heat.

Strapped into the chair, I flipped the switch and the torture began! (Queue lightning flashes and cackling laughter.) Every evening I would check on the actuator to see how it was doing, and every night the computer showed that the actuator hadn't missed a beat - it was averaging 12 pulls a minute. After the first day, I put my hand on the actuator to see if it was generating a significant amount of heat. Though I can't give an accurate reading, I can



tell you that it was slightly warmer but not really noticeable. I set my goal at 50,000 pulls, and got slightly more than that at 51,000 by the time I hit the off switch. (Figure 4)

Visually inspecting the actuator, it seemed fine. I pulled and pushed on the actuator lever and didn't feel or hear any discrepancies in the gears such as grinding, skipping, or slipping. While observing the torture process, I didn't notice the actuator losing steam or vigor when pulling down that lever. So back into my DeLorean it went, and a few door opening tests were conducted. It worked just as it had before... flawlessly. It wasn't louder or weaker, and the time it took to pop the latch (~1.5 seconds) was the same as it was prior to its encounter with the torture chair.

It would be interesting to see how long the actuator would go before giving out, but I doubt it would have given out before this article is published, and I don't feel like spending the money on a new actuator after destroying the one I have. So my conclusion is that, despite the plastic gears, these actuators are more than robust enough for our DeLorean doors. Plastic does have its advantages vs. metal, in that plastic doesn't rust, and more importantly for our already over stressed torsion bars, plastic

weighs much less than metal. Plastic can also help keep costs down. If your actuator does give out on you, it will be much cheaper to replace than a solenoid.

Now that we have more confidence in the quality of the actuators, we need to explore how hard it's going to be to install these puppies. The installation instructions consist of seven pages; three of which contain pictures for you visual types, and a template for drilling two holes. (Figure 5) Take Toby's advice, read through the instructions FIRST before picking up a tool. The instructions are very good at letting you know what you're getting yourself into. It's not hard to install the door openers, Toby does a great job walking you through the install, but you do need to make sure you understand some wiring basics and how to work a multi-meter. Also, your doors and locks should be in good working order. That means your struts should be good, and the door lines up perfectly with the door latches.

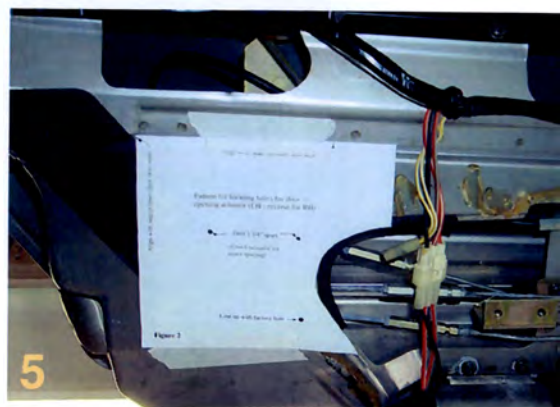
Now I'm not going to go into installation detail such as which wire goes where, and how to install the actuators, etc. The instructions included in the package are very detailed and there isn't anything I can add to it. I will, however, give you some installation tips.

1. Completely map out where you will put the "brain", and the placement and length of the wiring. It makes it easier to do a clean wiring job by allowing you to measure the length and cut off excess wire so you don't have extra that you have to tuck in somewhere.

2. This tip will save some of the skin on your hand. When installing the actuators, it's hard to reach your hand up inside the door to hold the washers and nut on the top of the actuator. I took some electrical tape, and taped the nut and washers to the top of the actuator just over the hole. (Figure 6)

3. Get some masking tape, wrap small pieces around each wire on the brain in a flag style. Now go through the instructions and label the wires. It makes life a little easier, and the installation goes much faster.

I can't tell you how much flack I caught from my fellow non-DeLorean owner tuner buddies when I mentioned installing an auto door



opener on my DeLorean. I heard all the jokes and insults about ricing out the car, and adding too much kung fu. "Why Dave? Why are you doing this?", they kept asking me. I could have explained it to them, but they wouldn't understand. I know if you are reading this, YOU understand. Automatic door openers on a DeLorean just feel natural; as if it should have been one of the many features that were stock on this car. It highlights one of the major features of its design, that of course being the gullwing doors. Darryl Tinnerstet, former DeLorean parts vendor and creator of the door openers now currently known as Wings-A-Loft™, couldn't agree more, telling me that "Having been around remote door lock installations in street rods, it just seemed like a natural thing to add to a DeLorean."

Darryl installed his first auto door opener on his third DeLorean back in 1987! I'm not even going to tell you where I was in 1987, but I was surprised to discover that the idea of auto door openers had actually been a reality for quite some time. So, did Darryl develop the first functional door opener? "As much as I'd like to take credit for coming up with the idea, to be honest I'm not sure who was the first to do it.", Darryl says. He knew of a few others building kits for their own cars, but no one was offering a package for sale, so he jumped on the opportunity.

Since that time, Darryl has sold dozens of units, and has yet to hear of any problems associated with his units which he simply called "Remote Door Opener Kit." He has, however, gained many happy customers over the years. Now Darryl has passed

that torch onto Toby and Misty Peterson and their new venture - DeLorean Parts Northwest.

This story ends on a happy note for me. Instead of insults and teasing from my friends, the only thing I heard coming out of their mouths were "whoa" and "that's cool" when I showed them how the openers worked. So does the Wings-A-Loft™ package live up to my criteria list? Yes, and does so brilliantly. But now I have a new list... and I want more features. Can DeLorean Parts Northwest deliver? Toby says, "Yes." Stay tuned!

Darryl, Toby, and Misty, you now have another satisfied customer. Thank you! ~ 🚗

Do you Dream in Stainless? We do...



We build the PermaFrame, a Stainless Steel replacement frame for the DeLorean. This is the product that many people believe should have been standard on the DeLorean. In addition to the PermaFrame, we also make Stainless Steel replacement trailing arms, front lower control arms, and heat stoves with more to come. Visit our web site or give us a call when you are ready to take your DeLorean to the next level.

Phone: 630 - 293 - 0945

Fax: 630 - 293 - 0944

www.pearce-design.com





37th Annual



WORLD OF WHEELS®

America's Center - St. Louis

March 19 - 21, 2004



Story and photos by: Cheryl Wester

2004





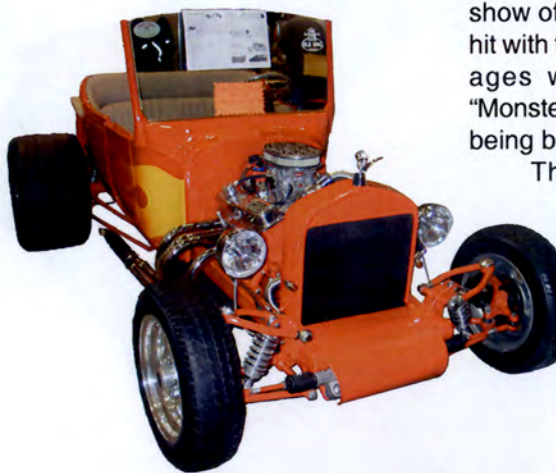
At this year's St. Louis WOW, better known as the World of Wheels show, we were able to participate with a wonderful turnout of many interesting vehicles. I must say, it's WOW!



We originally planned to have a block of eight spaces reserved for our group of DeLorean owners. As it turned out, a couple of owners couldn't make it, and the show organizer sort of forgot about how many spaces we were requesting to hold, but they did manage to make half of our requested spaces available. A couple of cars had to skip this show, but I don't think they minded too much staying in storage or getting a little technical tweaking.



Rich Weissensel and Steve Stump brought the Ford GT40 Rock Crawler from the Monster Garage episode down from the Chicago area for its second WOW show of the year, and it was a huge hit with the crowds. Spectators of all ages were excited to see this "Monster" that they had recently seen being built on the popular TV show. The few people that hadn't previously heard of the Rock Crawler were able to watch the continuous-loop footage on the display monitor along with many others who enjoyed watching it again.



Ron's screaming yellow "D" was parked inside the display alongside the Rock Crawler which was



towering over it, and together they made a bright and bold burst of color toward everyone approaching!

A couple of people were curious and asked what the connection was between the GT40 and the DeLoreans that were on display together, and they were impressed to learn that the Rock Crawler was built by a team of DeLorean owners. It's truly great to have so many talented and very enthusiastic (sleep deprived) mechanics out there that are always willing to take on such a monstrous task over an entire weekend. Our small D community is putting a big impact on the world of car buffs everywhere.

The (always hard to photograph indoors) stainless steel DeLoreans on display received their share of attention as a favorite of the fans, and were very recognizable in their original unpainted skin. Surprisingly, the stainless examples helped to identify to the general public what kind of car the painted one was.

My car was parked directly behind our group's "yellow car" end isle display, and brand-new owner, Jake Kamphoefner's car proudly completed the D arrangement by participating in its first ever show. Jake brought his new ride home to Granite City, Illinois only eight weeks ago.

I'm glad that I was finally able to use the chain and stanchion display that I had custom-fabricated out of stainless steel a few years ago for a World of Wheels show. Too bad it wasn't completed on time as contracted, but rather two weeks too late after the show. It was annoying to find the rental chain and stanchion setup pushed all the way up to the car by spectators that wanted a



better look or to climb inside the car, and I wanted something that couldn't be rearranged by onlookers at the larger show venues. I came up with a design that would be nearly impossible to move because all four wheels are parked on the disks or base of the stanchion poles.

Also, the poles that come out at an angle from the base are completely removable extensions so that they can be easily transported and store anywhere in the car. The internal threads are tightened or loosened with an Allen wrench. (I'll have to keep an extra Allen wrench in the glove box for the next time my hubby forgets to bring the tool back on the final day of the show!)

The display worked out perfectly for both of the stainless cars. We just extended the setup within the two spaces--Jake parked one side of his car on two pads and I parked half of my car on the other two pads. Instead of using a chain, I prefer the more futuristic look of lighted ropes which added a real nice touch that did the same job. The left front pole's end cap has a stainless steel sign for reading more information about "the man and the machine". The sign pivots/rotates to adjust for light glare on the acrylic cover, and is also removable if I should choose to not use it, or need it to be more storage friendly.

I've used the sign many times before and find that it helps tremendously with all of the questions that are asked at shows, or if we aren't around to answer questions at every moment. It bolts right on to our heavy-duty music stand.

Jake seemed to have a good time while answering questions about all of the cars, whenever he wasn't busy

watching all of the women walk by! (Just teasing, but Jake admits it's true.) He's in the photo between the posing TrimSpa girls and the DeLoreans below.

It was obvious when we set up the cars the night before the show that Jake was hesitant to leave his new ride behind. It would be the first night his baby spent the night away from the comfort of its home sweet garage. We offered our walkie-talkies to Jake, just in case he wanted leave one in his car to sing a lullaby to it after the convention center was locked up for the night.

This was an awesome show, and we had lots of fun over the three day period viewing many interesting and different types of trucks, cars, and motorcycles. We hope you enjoy seeing several of our favorite show cars over these few pages, and thanks for your interest in allowing us to share our experience with you.

Perhaps with a little more advanced planning, we'll be able to participate with a larger group of DeLoreans for next year's WOW show in St. Louis. ~26

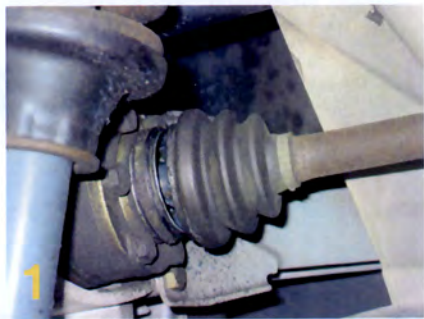


Spring 2003 Tech Day
at Steve Fincher's (Edwardsville, IL)

CV Joint Boot Repair and Replacement

Technical by: Marty Maier
Photos by: Ron Wester

A CV boot that's been pulled away from the retainer will allow dirt, sand, dust, and everything else to get inside the CV joint. If this contamination is allowed to work inside too long, it will chew the joint up and grind itself into pieces. When a boot gets to this point, it is time to replace it. (Pic 1)



Here is a different angle of the boot pulled out. You can see where the retainer and the boot are suppose to be clamped to hold them into place. (Pic 2)



To take the joint and boot assembly apart is a matter of getting a 19 mm open-end wrench to remove the six bolts that go all the way through each CV joint, that bolts to the drive flange on the transmission or the hub flange that's on the rear upright assembly. Go around and loosen up the bolts, taking them out one by one. (Pic 3)



The bolt heads are sometimes kind of hard to get past the rubber on the boot. The axle doesn't go exactly straight into the joints, they go in at an angle. What you can do is rotate the axle so that the bolt is on the side farthest away from where the axle bends, which helps with removal and installation of the bolts. (Pic 4)



Once all the bolts are taken out, the whole joint and axle assembly comes loose and comes right off the car. Normally when we repair/rebuild CV

joints, since it is quite a bit of time and work, we recommend to take the whole axle assembly out, rather than just doing one joint. Taking the whole axle assembly out and working on the workbench with it is much easier. You can see how easily dirt can get inside through the ripped boot. (Pic 5)

The first thing you need to do to disassemble the CV joint is to remove the small sheet metal cap on the outside end of the joint. That cap is just a snug press fit on the end of the body of the CV joint. Take a flat-blade screwdriver and a small hammer and tap it in three or four points around the edge of the cap and it will come right off the end of the joint. Now you can get to the inside of the joint where you need to be, to start taking things apart. (Pic 6)



With the outside cover plate removed, you can actually see what the inside



of the CV joint and axle look like with the stub of the axle sticking up through the joint assembly on the inside. You have to get to this point in order to disassemble the CV joint. (Pic 7)

There is also a cover plate on the inside of the CV joint body which is basically held on the same as the top one. It's just kind of a snug, semi-press fit. This collar is what actually holds the boot on the inside and the body on the outside of the CV joint. Here again, in order to release that cover you just take a flat-blade screwdriver and a hammer and tap it in a half dozen places and it will slide right off the back of the body of the CV joint. (Pic 8)



Once you get to this point, the next step is to actually remove the CV joint from the axle itself. In order to do that, you have to kind of dig around on the top of the joint where the axle comes through, and find the big snap-ring that holds the joint into place. Once you find the snap-ring, it's just a matter of taking some snap-ring pliers, pop the snap-ring off the end of the axle, and the entire CV joint assembly should slide right off the end of the axle. The axle and the joint are actually splined and the joint goes over a splined end on the axle. (Pic 9)



been removed from the end of the axle, you can see the groove on the end of the axle by the splines where the snap-ring goes in. (Pic 10)
The fun part of this whole project is

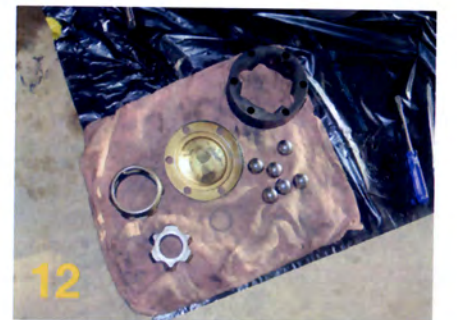


cleaning everything up. It's just a matter of taking everything apart, taking all the bits, pieces, and parts, and cleaning them using any sort of cleaner your heart desires. Kerosene tends to cut the grease very well, isn't quite as flammable as gasoline (not recommended), and does a good job



at cleaning parts. (Pic 11)

Here are all the parts on a shop towel after they have been cleaned. These are an inner spider (small star-shaped piece), the cage (ring piece with holes cut in it) which captures and holds the balls of the CV joint in place, the cover plate (piece knocked off with the hammer) which just seals things and keeps the dirt out, the main CV joint body itself (the big heavy piece) which the bolts go through—that also has all the grooves cut in it, and the big steel balls which are what makes the CV joint work. (Pic 12)
When doing the CV joints, you will



notice the balls are color coded - normally they are a silver color. I've taken joints apart and the balls inside had a red, gold, yellow-orange, green, or blue tint to them. What I've found is the tinting on these balls seems to indicate sizing variations. What you want to do is take one joint apart, clean it, reassemble that joint, and go to the next one. These balls are all precision-machined and precision-fit to go inside the sliders and grooves, and you don't want to start mixing and matching parts from joint to joint. Even if you have two CV joints that both have silver balls, I still wouldn't swap parts between them

because of the way they have run and worn together, and the way they're made. You don't want to start swapping parts, or you'll end up with problems with your CV joints down the road such as abnormal wear or loose fit, so do them one at a time.

Putting the joint back together again is kind of a jigsaw puzzle. By rotating and articulating the inner spider, the cage, and the outer housing, you can actually put the balls back in one at a time by twisting things 90 degrees back and forth, up and down, around and about. **What you'll find is that there are really only two ways to put the CV joint back together, the right way and the wrong way.** You can reassemble the joint, get all the balls in there and get it to fit, incorrectly. If you do this, what happens when you get the last ball in place, is that the joint will lock up and become rigid, and the inner spider assembly will not move or wobble back and forth in the cage and the outer assembly like it's suppose to. If that's the case, you just take it apart, rotate it one slot, put it all back together again, and then everything will work. (Pic 13)



Everything should slide back and forth, up and down, and articulate the way it used to.

When you take the joint apart, pay attention to the way the parts are assembled. You may want to match-mark the parts so when you put it back together again, you get all the grooves oriented to where they all match. It's not required, but it may save you the work of putting it together several times before it works right. (Pic 14)



In order to put a new CV boot on, you have to take the CV joint off because the boot slides on the axle before the joint goes on. Once you get the CV joint apart and remove the inner band on the CV boot, you can pull the boot off, clean everything up, and slide a brand-new boot on. The axle has a grooved area where the small collar of the boot sits to be strapped into place. Sometimes the new boot is hard to get on - it's like a 3/4 inch diameter axle trying to go through a 1/2 inch diameter hole. With a little bit of persuasion, you can get the boot to go over the axle while getting a good, tight seal to keep dust, grit, dirt, and road grime out of the inside of the joint. (Pic 15)



Once you get the boot on, what's next is to put the inner collar on. You don't have to tie it on with bands or anything else, but you need to slide it in so that it's all assembled first. (Pic 16)

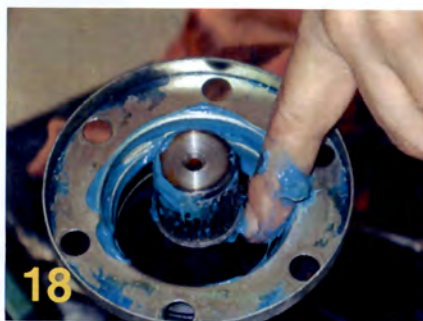


After you reassemble the CV joint, it needs to be packed with grease. You need to use a special high-temperature, high-strength grease for CV joints - found at any auto parts store. This grease is normally a synthetic-type made especially for the extreme conditions the CV joint has to run in. Pack the joint thoroughly. Make sure you have grease down in the spiders, down inside the cage, and everywhere. You want to make sure there is plenty of lubrication inside the CV joint. (Pic 17)



Once you get the CV joint packed, take some of the grease and smear it around the inside seal ring where the boot is attached. Spread some grease here, but don't go overboard or fill the boot with grease, because if

you do, it will just start squeezing out and you will have a leaking problem. The CV boot is there to keep dust and dirt out. Also grease the splines on the end of the axle, because the CV joint does slide back and forth on the splines. Sometimes we hear owners talking about a clunking noise when going around corners, and one of the things that can be causing this, is the axle sliding in and out of the CV joint even when installed correctly. It has to, because as the suspension travels up and down, the outside hub and CV joint move through an arc, while the inside CV joint is stationary at the transmission flange. So as the suspension travels through this arc, and the distance between the inner and outer CV joints change, the axle floats between the CV joints to compensate for the change in length. (Pic 18)



After everything is all greased up, take the CV joint and slide it back on the splines on the end of the axle until it goes down and bottoms on the shoulder of the axle. (Pic 19)



After you get the CV joint on the axle, reinstall the snap-ring onto the end of the axle to hold the CV joint into place. Clean up the excess grease. (Pic 20)



After the CV joint is in place, you need to pull the back cover up and put it back on the body so it seals, then do the same with the outer cover. You can tap it on lightly with a hammer if needed, no seal or gasket sealer is needed. It is all held into place when you bolt the CV assembly up to the drive flange or the hub. In order to line up all of the bolt holes, start with a couple of the bolts (using them like alignment pins) and then tap the cover on. Once everything is bolted into place, pull the boots into position and attach the boot bands to secure the boots as well. (Pic 21)



Bolt them back on, and you're ready to go! (Pic 22)



Tip: When you reinstall the bolts in the drive flange and the hub flange, use a drop of **LOCTITE® thread locker blue** on the ends of the bolts to make sure when they are pulled down tightly they are going to stay into place.

This is a one-day, or weekend project, and you can plan on getting dirty!

SUBSCRIPTION RATES: One year (4 issues) \$48 in the US, \$53 Canada, \$66 Foreign (US funds only).

BACK ISSUES: \$16.75 ea. US, \$18.25 ea. Canada, \$20.00 ea. Foreign (US funds only).

TO ORDER: Send check or money order to **GULLWING Magazine**, P.O. Box 991, St. Peters, MO 63376 USA or transfer funds via www.PayPal.com to GullwingMagazine@juno.com. Once your check has cleared the bank, your order will be processed. Allow 6-8 weeks for delivery for first issue. When changing address, please give 8 weeks notice with new address including zip code, as well as old address.

EDITORIAL CONTRIBUTIONS: To submit your own article or photographs for consideration in a future issue of **GULLWING Magazine**, mail to **GULLWING Magazine**, P.O. Box 991, St. Peters, MO 63376 USA or to GullwingMagazine@juno.com. Images preferred in JPEG format with 300 dpi minimum. All submissions become the property of **GULLWING Magazine** and will not be returned without prior approval. We will strive to acknowledge all submissions, but unsolicited submissions from free-lance writers may or may not be used or acknowledged and we assume no responsibility for loss of or damage to unsolicited material. **GULLWING Magazine** reserves the right to use material at its discretion, to edit all material including advertisements, photographs, and articles, for continuity, clarification, errors, omissions, space available (or other examples) for any reason and at any time, in order to meet our requirements. Upon publication, the author or contributor will be acknowledged and shall receive our "thank you" with a complimentary copy of the **GULLWING Magazine** issue in which their material was used, or, if a current subscriber, have their subscription extended by one (1) issue. Contributor's act of submitting contribution shall constitute an express warranty that the material is original and no infringement on the rights of others.

We occasionally give away tee shirts with customer parts orders and often people call back asking for more so we decided to release them for general sale. If you like Deloreans (and maybe even our company a little!) then you'll certainly like these shirts. This brand name all cotton shirt makes a great gift to give or receive. Now for a limited time (while supply lasts) we'll give you one ourselves with any initial parts order of \$200- dollars or more. Just tell us your color preference and size and we'll include one with your order.

P.J. Grady DeLorean Tee Shirt \$14.95

A. Gray with small black logo on front and larger picture on back.

SML - A5020001G
MED - A5020002G
LGE - A5020003G
XL - A5020004G
XXL - A5020005G
XXXL - A5020006G

B. Black with small silver logo on front and larger picture on back

SML - A5020001B
MED - A5020002B
LGE - A5020003B
XL - A5020004B
XXL - A5020005B
XXXL - A5020006B

P.J. Grady DeLorean Sweatshirt \$29.95

C. Premium quality, name brand.
90% cotton, 10% polyester.
Black with small silver logo on front and larger picture on back

SML - A5300001B
MED - A5300002B
LGE - A5300003B
XL - A5300004B
XXL - A5300005B
XXXL - A5300006B



PJ Grady Inc.

DELOREAN SALES, PARTS, SERVICE AND RESTORATION
118 Montauk Highway, West Sayville, NY 11796



1.



2.



3.



4.



4.

1. Aluminum Automatic Transmission Cooler Heat Exchanger

This aluminum finned heat exchanger lowers the temperature of DeLorean automatic transmissions by about twenty degrees in preliminary testing. It's possible to double the life of an automatic's internal parts with each twenty degree drop in operating temperature! This cooler is possibly the most cost effective purchase you can make for your automatic. Installs in minutes over existing cooler pipe with stainless straps and no tools, your transmission will love you for it! After all it's getting close to it's twenty second or third birthday. LIFETIME WARRANTY.

Part #111448G Introductory offer \$29.75

2. Reconditioned Battery Hold Down Strap

Many original battery straps have been damaged by electrolytic acid over the years and new N.O.S. straps are rather expensive. Now trade in your worn out or tattered strap for this reconditioned beauty with powdercoated mounts and buckle and new strapping material. It's better than new at half the price.

Part #108120R \$48.50 Plus \$50.00 Refundable Core Charge

3. Stainless Trailing Arm Shield Bracket Kit

We introduced this part about eighteen years ago to replace the cheesy little stud plates used to secure the T.A. shields to the DeLorean. We have sold hundreds of pairs with no complaints or failures over the years. They pay for themselves in saved labor costs each time you have the shields removed to inspect the all important trailing arm pivot bolts. We recommend checking and retorquing them every four years or 10,000 miles. The first time you try this yourself you will swear the original studs were designed by Satan himself often requiring two people brandishing wrenches, screwdrivers and sometimes hacksaws or "muffler cutters" to accomodate their removal. You won't want to do it the same way twice and neither would your mechanic. Trust me when I say they'll save you time and/or money. LIFETIME WARRANTY.

Part #110811G \$32.95

4. Stainless Engine Cover Screen Bracket Kit

Designed to replace your rusted and/or missing brackets, these will never rust and are more affordable than the originals. A set of N.O.S. brackets will currently set you back \$188.58. Brighten up and customize your engine cover with the stainless finish or keep it stock looking but rust free with the black finish version. The choice is yours. LIFETIME WARRANTY.

Natural Stainless E.C. Bracket Kit Part # 116388GS \$ 99.75

Black Stainless E.C. Bracket Kit Part # 116388GB \$124.75



PARTS ORDER LINE:

800-350-7429

website: pjgrady.com

TECH INFO LINE:

631-589-6224

e-mail address: info@pjgrady.com

FAX: 631-589-6241

HOME OF
ZILLA
PERFORMANCE
ELECTRONICS



Why Climb Mountains?

At DeLorean Motor Company in the closing years of the seventies, most of us dreamed of proving a point that the Japanese ended up proving for us. There were some minor miracles performed in launching the DMC-12, unparalleled at the time, that The Big Three would snuffle at until the lights started going out at Chrysler. Specifically, they included the still-prescient design and the record time the car went from paper to production, matched by the blistering pace the Dunmurry plant did the same. All achievements considered so unattainable as to be ludicrous, except that John DeLorean and Company, and later Corporate Japan, did it. While that may be another story, it's the beginning of this one.

Some people own DeLoreans to collect them, some own them to show, some own a stainless steel workbench, but I bought mine to drive.

In late 1983, the DMC-12 cost far less than the glamour machines of the day, like the Z-28 and the 280ZX, while being much more fun to drive. With a little judicious shopping, it also cost much less to insure. Peering out into the future, with a bit of TLC, it would hold its value better than anything else would at twice

the price, and in the meantime, you wouldn't just drive a car; you'd drive a DeLorean.

Bottom line is, I wanted to see what we'd accomplished back there in Sterling Heights and Manhattan, so through sun and snow, drive it I did. No sissy stuff either—about 60,000 miles worth; cross-country, back and forth to work every day, parking in Downtown Chicago, just like your mom's mini-van. How did our creation measure up?

Among other things, I discovered that if you drive these things a lot, they're pretty reliable cars. Are they practical? They haul groceries, suitcases, and golf clubs; sip gas, scoff at snow, are a godsend in a tight parking space, and a buck or so at the do-it-yourself car wash shines it like new. How good does it have to get? Are they economical? See above and below. Are they fun? Far be it for me to preach to the choir on this one.

Anyway, over twenty years of driving, the car did one other very surprising thing. It restored my faith in human nature; not a single door ding from the countless parking lots, just fingerprints by the windows. All at a low cost, high style, and 30 m.p.g. - some achievement.

REALITY!
STAINLESS STEEL ILLUSION



Article by: Ray Parrish
Photos by: Ray Parrish & Danny Botkin
Photo Illustrations by: Ray Parrish

Mr. Phelps Goes on a Mission

IMPOSSIBLE



R_x for R Baby

Around 1998 or so, Achilles' Heel was upon us—we couldn't keep the rust at bay any longer. All along, we'd faithfully visited my buddy's body shop, valiantly scraping metal, rust proofing, and welding, but the ruthless moisture and road salt invaded the frame from inside. It was either time to shoot the horse or commit to major surgery.

Now at this point in our tale, you have to understand that the car was as much my girlfriend's idea as it was mine. In 1983, I was two years on as an Air Force pilot and looking for my new first-lieutenant jet-jock ride (ah, youth) — the usual storefront sport coupes, vintage T-Birds, and the shining star of my DMC days - DeLoreans. So one fine crisp fall day, walking through the parking lot to a Purdue football game, my girlfriend saw her first D. There under the golden sunlight and the brilliant deep blue sky, instantly enamored, her fingertips drawn to the cool brushed stainless, she was smitten (by the car). She said, "This is an entirely different kind of car. I think you should get one of these." "Not a mini-van?", I asked. (Now that's my kind of girl.)

I bought the car, married her, and drove away from our wedding in The Big D. In 1998, when I gingerly broached the idea of shooting the horse, it was my wife whose compassionate wisdom saved the day. We were not about to leave the baby at the monastery in a basket either - scrub up doctor boy.

We started by combing through the car's maintenance log, a poor-man's version of its aviation counterpart. Having flown lovingly maintained vintage Boeing 707s (hand-lacquered cockpits, custom stainless throttle knobs) in the Air Force (all volunteer no less, courtesy of the mighty 434th), and the stalwart HD 727 for the airlines, it was easy to see what good maintenance and periodic overhauls can mean to the life of a worthy machine. In addition, if the Wharton-educated financiers of the nation's airlines have discovered that care like that pays off in dollars and cents, who am I to argue? So I collected every gripe I've ever had about the car and put them all on my wish list. Time now for a good doctor.

For the last twenty years, two people have talked me through the care and feeding of The Big D, guiding me to the best parts, and saving me from countless primrose paths - Don Steger at DeLorean Motor Center, and Rob Grady at P.J. Grady. Tough decision as to whom would get this massive job.

I visited Rob at his shop on a couple of layovers in Sayville and broached the subject with him. His work is terrific, his shop bustling, and he was admirably honest about telling me that his time frame was probably too booked. Not an easy thing to say, as this project would be big bucks, but that's the way Rob has always been, and the man raised the bar that day.

At the same time, I also talked to Don Steger and the recently arrived Danny Botkin at DeLorean Motor Center in

Garden Grove, California. With the arrival of Danny, and a relative lull in business (only two other restos - Danny's BTTF, and a sweet boulevard custom to be featured in the next Gullwing Magazine), they were pretty comfortable with taking on another major resto, so I faxed them the wish list. Not only were they undaunted by the scope of my project, they were clearly fired up about it. It was time to take the wish list and turn it into a formal specification welded together by a solid design philosophy, but which philosophy?

Now I could have done the showroom thing, but remember this car is a driver with a twenty-year shift coming, and besides, the frame numbers will never match - ersatz showroom at best. On the other hand, we could have tricked it out as a show car, but this is a treasured friend valued for its own merits, Pygmalion as opposed to Phoenix. What path is ours, Grasshopper?

Enter Fred Astaire. You see, Ginger Rogers was always pretty good-looking in her own right, but Astaire made her look great, no mean feat at that. I never really thought of The Big D as Ginger Rogers (my wife says the car is a "he", she also came up with the nickname). But we concluded that the mission here was not so much to change the car, but to showcase its achievements as Fred did so flawlessly.

So despite a love for custom cars, Design Spec Number One was to keep the D looking and running nearly stock, enhanced by the latest technology and 20/20 hindsight, so it would continue to be the car we all dreamed of back in Detroit. Let the car grow into its looks.



Simple Elegance of Design

That's Mr. DeLorean's phrase - often said when he reflects on the giants of engineering like Colin Chapman or Burt Rutan. It speaks of vehicles that roll through the slipstream like the phrase itself rolls off the tongue. JZD's landmark work needs to be understood in order to bring out the best in it.

It helped to try to get under that particular hood, so we would know where to "put the wrench" so to speak. After all, as the New York art wags found out at the Guggenheim Motorcycle Exhibit a few years ago, us motor heads are far more artistic than we generally think.

To begin with, the D's striking exterior will go down in auto design textbooks as the pinnacle of Giorgetto Giugiaro's work, in my opinion, and he in turn will come to be seen as the heart and soul of the entire 80's styling aesthetic. During gestation in the 70's, Mr. DeLorean had the wisdom to give Giugiaro free rein in the styling department, a courageous choice few designers of JZD's caliber have the guts to make - prescient indeed.

Ergonomics and mechanical specs were all the constraints given to Ital Design, save for the stainless and the doors. The result is that the D is no less than the culmination of a movement, much like Frank Lloyd Wright's Robie House. One could even argue the car is the automotive equivalent of Wright and Le Corbusier's notions of organic architecture. A "machine for driving," to paraphrase Corbu, unprecedented and unparalleled since.

As a matter of fact, though late modern at

first glance, the DeLorean is firmly postmodern in the way it effortlessly catalogs several other major design movements that hallmark the twentieth century. The car's proportions echo Le Corbusier's theory of the modular. (Try parking your die-cast in front of a photo of Villa Savoye.) It interprets the venerable Chrysler Airflow the way Philip Johnson's Glass House interprets neo-classical forms, proportion, and scale, but in the most modern of materials and vernacular. (Parking your car at Mr. Johnson's makes it look like it came with the house.) While doing all that, it manages to avoid the anomy of stark, alien forms that plague modernist design by overlaying an approachable softness reminiscent of a Mies Van Der Rohe sofa, and it speaks to us in the familiar "sinology" of the auto world even as it explores new forms. For example, even though it's a gullwing, you know instinctively how to get into the car - a tall order rarely achieved - nice work.

Ultimately, the composition is so focused and succinct, the elements so skillfully orchestrated, you can make changes that make the car look good, but it's near impossible to make it look better—the gold standard of good design. Ironically, with one exception - blueprint lowered suspension, but it was Giugiaro's blueprint. (More films at 11:00.)

"Revelationary"



In short, I think we're all finding out that this is a rock-solid seminal design, seasoned by the test of time that will become a textbook for generations to come. Certainly nothing remotely challenging it has appeared since. (And *Car and Driver* thought it would quickly look dated. Ha!)

In fact, when it comes to being timeless, I'm surprised how popular the car has gotten lately, not having driven it since

'98. My brother and I recently did the Tod and Buz (of Route 66 fame) thing, taking it out for a weekend shakedown cruise Metro L.A., following Phase One of the resto. (For more information on the Route 66 reference, go to: <http://route66.freesevers.com/r66epguide.html>.) Remember that at street level it looks stock. (Boy's day out with a wicked custom DeLorean - pinch me.) Driving down Rodeo Drive in the company of a 308 and an immaculate original 427 Cobra, the heads and cameras were on The Big D. You'd think there would be at least a few astute design critics window shopping on Rodeo, so I took this to be an expert appraisal. (Surely they weren't tourists.)



From The Ground Up

The first step in spotlighting the visions of Team DeLorean and Ital Design was a cinch; P.J. Grady's suspension lowering package, with adjustable ride height, nitrogen shocks, and Don Steger's adjustable rear lower control arms. That decision was a knock. At long last you can tweak the suspension at the track. Out of the box, the handling is joyfully precise as always, the ride is even better if that's possible, and the long-lost pouncing posture is back, factory spec.

To make all the toys roll nice, we debated chrome DMC rims, but ultimately decided they'd draw focus (remember Bob Fosse in *All That Jazz*?) from the delicate sheen of the brushed stainless skin, so we powder-coated them to original spec. That said, if your design bent is California Custom, the chrome DeLorean wheels blackened between the spokes are drop-dead gorgeous. Don can't believe I didn't cave.



Now if only we had a rock-solid frame like the one many of us all remember when the car was new, wouldn't that be great?

Deciding what to do with the Chapman box-beam was nowhere near as neat. First we painted a frame, but fearing the Indiana salt would have a field day with the paint just as it did the epoxy, we decided to galvanize instead. Don and Danny patiently hung our beautifully painted frame in the shop for a more suitable buyer, and we prepped and galvanized a second frame. But no, the tale doesn't stop here. About this time word got out that Reg and Bryan Pearce were going into production with their long-awaited stainless steel frame. Hang another one and hold the zinc - boys, it's time to go to Chicago.



Stainless—The Once and Future Frame

The PermaFrame is the stalwart backbone the car should have been born with, not that we didn't try. **To begin with, when you're talking about stainless steel, corrosion and obsolescence are distant anachronisms - 'nuff said. As for stress performance, Bryan consulted with John DeLorean himself about the D's original stainless chassis, rejected in the development days over fatigue issues. As Reg pointed out, the radius bends in the prototype metal were spec'd for conventional steel, but proved too small and brittle in cold weather for type 304, so he enlarged all the bends in the frame to compensate. The prototype also had problems with spot welds cracking in the cold, a problem solved with seam welds in the Pearce Design version.**

The result is that Bryan has the first PermaFrame in his daily drive DMC, with well over 110,000 miles on it, and that's driving in the nasty Chicago winter cold.

I'd say it has road tested pretty well. Did I mention that it's significantly stiffer than the stock (not to mention the sandblasted) frames, and lighter as well? I'll tell you what, that isn't the really inspiring part.

Reg and Bryan's frame, sitting on the rack in the shop, glistens like sterling silver jewelry, but stainless-heads like us would expect that. The workmanship is what really gets you - the welds are smooth, the beads healthy, and every milling carefully filed by hand. Wow!

As if I needed to be impressed further, Reg showed me a bracket consisting of a single piece of sheet metal hand-bent to seven distinct planes with no two bends, edges, or planes either parallel or at right angles. He drew it on paper without even bending up a piece of cardboard - wish my brain worked that way - impressive.

Ultimately, we couldn't bring ourselves to paint that frame, so underneath the body is a gleaming handmade stainless frame with matching space-aged front control arms and trailing arms. (No more busted pivot bolts, this is a massive ball joint known as a Hyme Joint - supported outboard and inboard, it solves the intense concentration of stress on the old unsupported bolts, and allows a greater range of controlled movement.) Crawl under your car and see if your trailing arms and lower control arms have cracks, because they may stretch. Finishing the piece, all the new metal is elegantly punctuated by black-oxide corrosion-resistant bolts. On the street, looking below the front bumper in the bright sun, you can just see the glint from those stainless arms. Something very cool is going on under there - an idea we would soon build on.



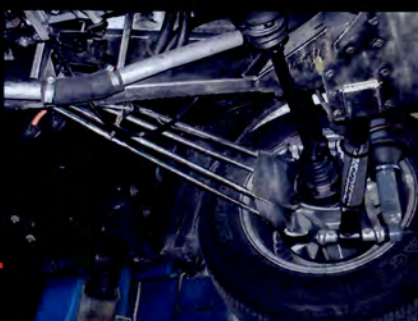
Live Long and Concours

But first, Design Spec Number Two: think long-term. The driving spirit of this car is durability to go with the performance, and that suggested the next round of mods. To begin preparing the exterior for the next twenty years, we replaced all the weather seals, reattached all the edge trim, and freshened up any oxidized deep gray paint.

To restore the showroom sparkle, Danny talked me into reworking the front and rear urethane fascias, painting the silver parts the original color, and rubbing out the oxidized black portions. On seeing a sample at the shop, it was evident that this was a detail that would really put the bow on the package.

On the business end, the crack-prone engine cover was replaced with the new upgraded model featuring better dust-fighting paint, and a beefier backbone with a neat little hook to hold the inner lid up. (It took me a minute when I first looked, to notice the place where the lid loop goes is cut to form the logo "DMC"... too neat.) A much sturdier system than the springy old lid brace, our beloved if precarious doorstop is now reassigned to backup duty. To complete the exterior upgrades, we made the DeLorean Safety Vehicle even safer; adding brighter eyeballs in front, P.J. Grady's high-intensity case-hardened circuit boards in the taillights, finished with a third brake light to the top louver. (Corvette unit to be exact, very elegant - looks like it was born there.)

Then Danny came up with a killer number one mod. As we were resealing the engine, he suggested we chrome the



intake manifold, timing chain cover, valve covers, and oil pan. At first I was on the fence about this one, vis-à-vis showcasing the original design work, but thinking it over, I saw how it would spotlight the car. At a cruise-in, with the lid open, it's a dazzling show machine, and dazzle it does - trust me. But with the lid down in street trim, the chrome peeks discreetly out from under the rear end like a hint of lingerie under a woman's blouse, once again quietly suggesting intriguing things underneath - way cool.

Intriguing things indeed, killer number two mod - coupled to the aforementioned jaw-dropping hardware is our trusty little PRV, fortified with seven pounds of boost, courtesy of an Island Twin Turbo finely tuned by Mr. Steger, connected to the wheels by an overhauled stock transaxle and a high-performance CenterForce clutch. **(The CenterForce clutch was born in the racing world where turbo-stoked torque at high revs makes conventional clutches slip. The CF overcomes this not with the usual gorilla pressure plate, but with an ingenious centrifugal weight system that applies more pressure to the discs as the tach climbs. Clutching is as easy and smooth as ever, but the discs hold like their thigh-withering cousins. My wife can still drive the car - darn.)** No question this power package is a great mod in its own right.

However, not content with power alone, Messrs. Botkin and Steger breathe the beast from a muscular custom cool-air intake, detailed with a dash of street-rod style in chrome and midnight black powder-coat. **Cold-air induction has two advantages. Normally, most turbo systems draw air from the high-pressure layer at the nose of the car after it passes through the radiator. The heated air forces you either to back off the timing,**

sapping the power you're trying to develop, or to cool the throat with inter-coolers. DeLoreans, however, have those handy little air scoops aft of the rear quarter windows, so the V-6 has a dedicated breathing space close by. The custom intake system uses this advantage, allowing Mr. Steger to tune closer to the limit for performance while making the unit lighter, mechanically simpler, faster, more reliable - nice.

To keep the fluids moving, the exhaust draws through custom manifolds; waist-gated and mated to twin catalytic converters and a pair of fat throaty resonators to play the music Enzo Ferrari liked so well. (For those not of the *tifosi*, he said his cars didn't need stereo, as the engine note was all the music anyone should need.) Neither gluttonous V-8 thunder here, nor the howling alto of the European GT, this setup has a one-of-a-kind baritone growl that sets off car alarms in the parking garage.



Driving Impassions

Is it quick and drivable? The enhanced power unit is wonderfully smooth at low revs with plenty of torque on hand for finesse in the parking lot or on the boulevard. As it climbs the rpm band, the boost comes on at around 2200 rpms with a predictable, smooth attack, and just keeps pulling harder as the tach winds up, planting you ever more firmly in the seats. The stock gearing gets along quite well with the newly buff mill; playing the shifter on the esses is a piece of cake, with plenty of torque on hand to balance the car on the throttle. For cruising on the e-way, the roll-on power in 5th is pure joy. If you like twisty roads and open highways, this is a mod you'll quickly fall in lust with.



On the Troll-ways

Spending time even in the dark and remote corners where cameras rarely look, we wanted to make the car equally stout under the skin. For starters, the electronics have been updated with the complete Zilla suite and the latest relay package. Stainless-braided corrosion-resistant lines course through the body for the brake, clutch, and fuel systems, and the cooling system is armored with powder-coated steel plumbing and Gould Marine hoses all around.

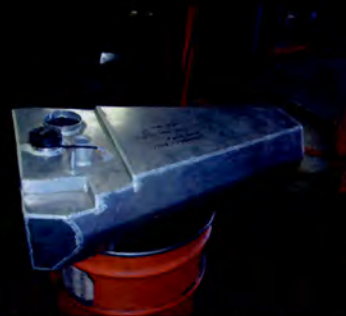
Sludged like a Chicago highway during construction season, even in '98 the fuel system needed a rebuild to clear the arteries, despite the fact that this car had been a daily driver its entire life. To protect our now-pristine pipelines, we elected to replace the urethane fuel tank with DeLorean Motor Center's aluminum tank and baffle to cure fuel contamination once and for all.

In the running gear department, we overhauled the braking, steering, and AC systems, and finished with a GM 150-amp alternator, a little item we'll discuss in a minute. Other welcome upgrades include improved cooling fans, tougher window motors, and those wonderful emergency release cables for the fore and aft hatches.



Polishing the Diamond

So much for things people like us salivate about with the car on the lift. (And it's very striking up there. Wonder if my wife will let me have one?) What about when it's sitting on the wheels over asphalt? They do that sometimes.



Entry into this car has always been an event, and now, with a couple of extra solenoids in the remote door lock/security system, it's a feature attraction. Approaching the car, it greets the driver by opening the doors all by itself with a touch of the remote key - slick. They reach top smartly with no hint of sag as the security system chirps its acquiescence. Opening the door has officially become an experience.

As you slide into the cockpit, adorning the door sills are elegant custom carbon-fiber sill plates - "DMC Twin Turbo" - refined, nicely understated pieces designed by Ron Wester, and added complements of Dan Botkin. No bumper brags here, just another declaration confident in its discretion. The car knows what it is - a signature piece of jewelry to commemorate the people whose works live in this car. Thanks Dan, perfect touches.

Giugiaro's thoughtful ergonomics and sumptuous interior have had a special place in my heart ever since I first sat Prototype 1 in Detroit. Decades ahead of its time, combining cutting-edge technology and spare ornament with graceful organic contours reminiscent of the aforementioned Mr. van der Rohe, it somehow achieves exceptional proportions and fit, generous even in cars twice its size. A great interior difficult to improve on, an easy one to clutter with too many toys, it demanded we choose our upgrades carefully. So now the Garden Grove interior embraces afresh with new headliners and carpeting, supple new leather on the seats, black O.E.M. floor mats, all set off with the subtle touch of a stitched-leather binnacle, and all faithfully restored in original gray - more inviting than ever.

Seamlessly blended into that OEM carpet are some finely hand-contoured new panels with Alpine silver filtering through stout black speaker grills. A glance in the back tells the tale. That big GM alternator has its work cut out for it driving killer Mod Number Three: a seriously powerful Alpine sound system. Recreating concert halls with tweeters in the old dash mounts, midrange kickers neatly tucked into the foot wells, two more on the back bulkhead - flanking an ominous aluminum-finished 200w amp, and a subwoofer pulsing mightily in what used to be the security compartment behind the drivers seat. All without intruding on the space that so comfortably opens up to you when you sit down - Steppenwolf in "Sensurround".

Audio file: The sound system was custom spec'd for DMC-12s by DeLorean Motor Center, with Joe Kamarmy and Dan Grant at Pacific Audio and Alarm. It's built around Alpine electronics for their exceptional power, sound quality, and longevity.

The control and input head is a satellite-ready CD/MP3/Radio Alpine CDA 7998, with controllable 6-channel crossover, onboard subwoofer control (You'll be surprised how much you use these last two features if you've never had them, particularly when competing with the Turbo PRV engine note. You'll quickly adopt favorite settings for particular songs and artists, making the programmable preset feature especially welcome) and featuring a removable resident antitheft system. A retractable faceplate allows for an oversized control panel in a conventional stereo slot such as the D's, making the generous ergonomics a fitting complement to the overall fit of the interior.

Power is provided by a separate 200w rms, 5-channel, Alpine F-450 amp, recessed into a custom panel on the luggage deck, requiring only two or three inches of your valuable storage. Your roll aboard suitcase still fits comfortably.

The speakers Pacific specified are each optimized for a different frequency range and volume to suit their placement. For tweeters, we've found the OEM DMC dash speakers (with resistors added in-line to provide crossover segregation for the high range) reflect the treble-

end nicely off the windshield. The kickers and rear speakers are two-way Alpine Type R units, chosen for their power and superb frequency response. 160w 6 1/2 inch circulars installed on the floor, and 120w (because they're closer to the ear and require less growl) 6 X 9s installed in back, with that selectable crossover on each channel, so useful for optimizing each of the myriad acoustic environments auto speakers must contend with. A 250w 8 inch MTX subwoofer thumps away unobtrusively in a custom panel that replaces the cover for the lock box behind the driver's seat.

The whole system comes packaged with a remote. (I'm trying to imagine what anyone would do in a DeLorean that would require a remote - hmm.)

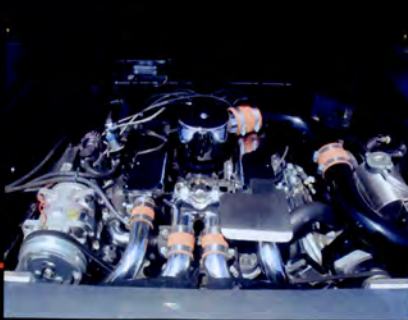
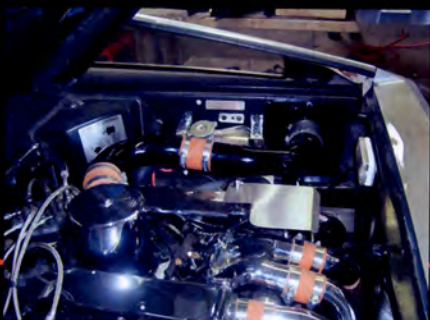
Finally, when the sun goes down, this velvet glove environment is all very peacefully lit by the glow of colored LEDs thoughtfully placed out of sight - plush.

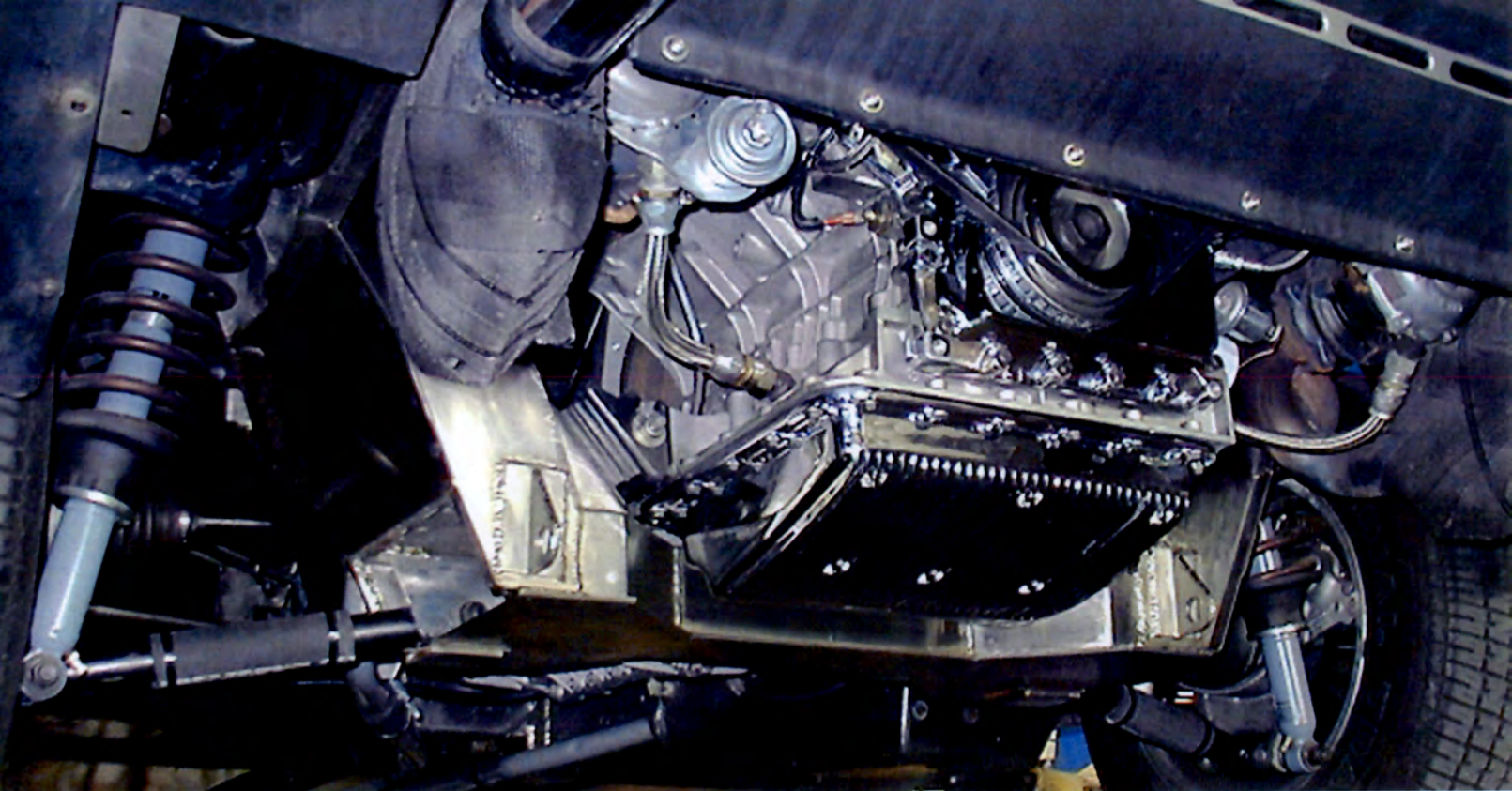


Judgment Day

With all the heart and soul that brought this car to life, the \$64,000 question remains, is it still a DeLorean, or just a custom eclipse of the heart? Now don't get me wrong, museum pieces have a valuable place in the grand scheme of things, but the idea here was to build a driver, so did we really succeed in creating an Astaire for Ginger? I suppose it sounds like the car has become a show machine, and in less capable hands it might have. Quite the contrary, in my opinion, it's more DeLorean than ever—that's the beauty of it all.

Seen from the street, with the exception of a flash of chrome or stainless here and there, the car looks like it did on John and Giorgietto's drawing boards. It's a tribute to the vision of the artists who started this whole thing. The new polished metals serve only to lead the eye.





On the inside, the Giugiaro/DeLorean interior continues to be true to concept, refitted for the next two decades, and with only selected enhancements to bring out the composition to refine the ergonomics. We make the glove fit better.

Underneath, in the Late Modern tradition so infused in The D's design, form follows function in the new stainless and the running gear that "modifies" the car. Modified not to make it different, but to make it robust. To make it the horse for the open range it was meant to be, comfortably part of its habitat, not a fragile gem cocooned unseen in a climate-controlled retirement home. (Kind of like those gorgeous old 707s.)

On the other hand, I suppose this could all be nothing more than hand wringing over a rationalization and not a guiding design philosophy for a restoration project at all. Certainly I'm no saint, at least yet, so on to that other hand. . . .

For starters, the turbo is for fun, okay? Guilty - this is a sports car.

As for the stereo, the modest O.E.M. system would have sufficed, I suppose, but what's driving without music, and what's music if you can't hear all the instruments? Got to make the tough calls.

As for the chrome, what on earth is chrome doing on a DeLorean? Perhaps that's the part of the car that belongs to

the Post-Modern future, highlighting the "deep structure" the Post-Mods like architecture critic Charles Jencks finds at the heart of good design through the ages. (I'm sure that's what Danny was thinking.)

Or maybe it's all just the gear head in me that wants elegance one day and hot-rod flash the next, day in and day out, all within the context of the achievement so many of us dreamed of years ago at DMC. Undoubtedly, it's the car my wife was so enamored of that day in Purdue's parking lot.

Looking back, we could have sold the car for parts. We could have bought a ZX, but that's just a car. No thanks; we'll drive a DeLorean. (Pinch me.)



Special T Auto

John Hervey 972 564 1321 | 972 672 3739 | john@specialtauto.com

ORDER PARTS ONLINE AT WWW.SPECIALTAUTO.COM

**STOP BY OUR
BOOTH IN
PIGEON FORGE!**



Delorean AC compressor kit.
for R12 or R134a
with new accumulator, orifice
and O-rings.



Brute Master®
#1 name in Delorean Alternators!
Starting at \$239.95. D130, 140, 150+



Relay Kit with new RPM Relay
Contains:
8 40 amp relays
1 Lambda relay
3 circuit breakers
1 RPM Relay & 6 Terminals



Clutch Kit by Valeo
Factory new and fresh
Includes pressure plate, clutch disk,
throw out bearing, pilot bearing,
alignment tool.



Delorean Water Pump Kit
Comes with everything
needed.
5 year warranty.



Delorean Starter
Rebuilt with all new parts. Factory original
Paris Rhone OE solenoid. \$189.95
\$100.00 core charge.
5 year warranty



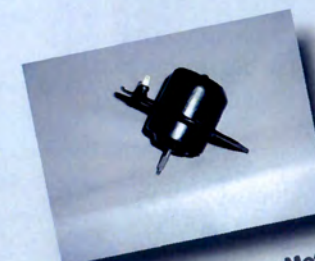
Delorean Strut Kit
Gas spring lift pistons struts,
door, bonnet/luggage and
engine louver.



Performance Upgrade Parts
K&N style filter, 8 mm custom
wires, MSD Blaster 2 coils and
much more!



Stainless Steel Fuel Line Kit.
Core charge \$50.00 for old lines and
connectors. Hand made to fit:
6 for injectors, 1 for the cold start, 2 for
the warm up reg.



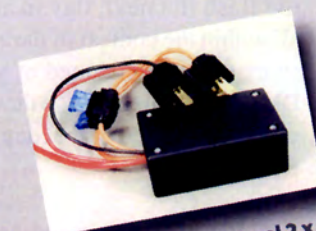
De Lorean A/C Blower Motor
The correct one, the correct fit and
no wiring to change. Turns the
correct way.



Delorean Front brake caliper.
Rebuilt caliper only.
Add your own brake
shoes or ours.



Bosch Basic Delorean Tune Up Kit
Includes wires, distributor cap,
rotor, your choice of heat range
plugs. 6, 7, 8, 9, or 10, due to
the age of the engine.
Includes free oil filter.



Delorean Fan Fix Dual 2 x 2.
Almost as small as a pack of cigarettes,
but strong as the The Fan Fix One and
Two.



Complete Delorean Fuel Update Kit.
Kit contains all you need to convert
from the old pick up hose that can
collapse from heat and pressure.
Helps Cut down on fuel pump noise.
Simple and easy to install.



Delorean Crossed Drilled Rotors by PowerStop.
Each rotor's vane structure is analyzed to
determine the optimum pattern. All
CAD and CNC pattern design. Each hole
is radiused to produce a smooth
transition at the edge. Plated to protect
from rust. Normally run 250° F cooler.



New De Lorean Fuel Pump
957 ver. comes with a new
external check valve. This
is the new update.



De Lorean Otterstat
Temperature/coolant fan
switch. Lower left hand water
pipe. Don't strap your circuit
to make the fans run all the
time, just install the right one
for your climate.
includes rubber gasket.



New Fuel Tank Baffle Assembly
Includes the new all aluminum
baffle, screen filter with aluminum
barbed fitting, clamps, and special
fuel/chemical resistance hose.
Comes with instructions.



**Delorean Custom Vacuum
Silicone Hoses Kit.**
Cut to length. Plug and play
Blue & black.
Also fixed the odd size coming
off the warm up regulator.
No clamps needed.



Delorean Brake Lines.
Stainless Steel DOT
Approved.
Exact replacement. Highest
quality hose of PTFE inner
Teflon and stainless steel over
braid.



**Delorean custom 8mm
spark plug wires**
Less than 350 ohms/ft. resistance and
thicker insulation. Slip on your plug
cover boots and your ready. Includes
the coil wire w/new boots. Upgrade
from stock 7mm wires. Professional
hand made and crimped. Lifetime
warranty.



Trailing Arm Bolts
This is an upgrade from the original.
Heavy Cad plated for greater rust
protection.
12.9 vs 10.9 tensile strength.
Connecting to frame and trailing
arm.



De Lorean Accumulator
For hot start problems
this is it most of the time, if
not then call me.



Air Bleeder
Don't overheat. Install the air
bleeder and protect the
cooling system.

Teaching an Old Dog New Tricks

Article by: Joe Kuchan

Photos by: Joe Kuchan and Ron Wester

TURBOS THE ULTIMATE POWER-ADDER



The B.A.E. kit all spread out. (Muffler not shown.) Could this be the last unused B.A.E. kit for a DeLorean? Most likely!

My son Peter, owner of the car this article is about, has always loved cars. Prior to buying his DeLorean he owned two Camaros that we worked on together, and which he raced at local drag strips. But ever since seeing "Back to the Future" as a kid, he really wanted to own a DeLorean. So when the chance to buy one in good condition presented itself, he had no second thoughts about selling his 435 horsepower Camaro SS to make his dream a reality. Initially, Peter focused on improving the appearance and reliability of the DeLorean, and the results were both obvious and satisfying. But as owners know, the storied DeLorean is long on "show" but short on "go", and it didn't take long for the car's poor throttle response to put a

damper on the overall fun of ownership.

With virtually no other hot-rodding parts available for early 80's Volvo motors, a turbo is the most logical approach to improved performance. It's not surprising then, that three different turbo setups were made for the car; those being the Island Twin Turbo, the Legend Twin Turbo, and the B.A.E. Single Turbo, the installation of which is the subject of this story. By the way, B.A.E. stands for "Bob's Automotive Engineering", and despite its homey name, B.A.E. was once the largest manufacturer of aftermarket turbocharger kits in the world!

Having heard from Dave Swingle that

(what was probably) the only remaining, never-before installed B.A.E. Turbo kit for DeLoreans anywhere in the world would soon be put up for auction on eBay, Peter contacted the seller directly and made a deal that avoided the tension and potential disappointment of an auction. Excitement and anticipation were now running high around our household!

A short time later, three large cartons arrived. The day they arrived, we unpacked the boxes and admired all the beautiful pieces as we flipped through the instruction booklet to get an idea of what we'd be doing over the next few days. It was pretty cool looking at what could almost be called a historic system, and imagining it on the car. Remember, this was probably the *last* "new" B.A.E. kit for DeLoreans anywhere!

At its most basic, a turbo is nothing more than a simple air pump, but hooking up this air pump requires "plumbing" three different systems:

- An oil supply/return system to lubricate and cool the turbo's bearings
- An exhaust inlet/outlet system to drive the turbine
- An air inlet/outlet system to force a more potent air/fuel charge into the motor

The job really isn't too difficult, but as you'll see, it can have its moments!

Preparing for Installation

Luckily for us, Dave Swingle was about to host the local DeLorean club's spring tech session. Now installing a turbo, even from a complete "kit" such as this, is a fairly involved project, so we arrived at Dave's place three days early to get as far as we could with the installation prior to the arrival of all the other cars. Even with this head start, we knew we'd probably still have a few loose ends to tie off on tech day itself, but if by the end of the tech session weekend all we had was the car put back together and running again, we'd be more than satisfied.

The first thing we did was to inventory the kit contents. All of the important stuff was there, including a shiny Rajay 300 series turbocharger! The only things missing were a couple of high-temp exhaust gaskets for mounting the wastegate and the turbine housing to the up-pipe, which B.A.E. quaintly calls the "B.A.E. Exhaust Manifold". Fortunately, Marty Maier had brought along a couple of spare turbo gaskets, but we were still missing a rectangular gasket for the wastegate. I bought some high-temp gasket material at a local NAPA store, and we set out to make our own. This turned out to be far harder than we ever imagined. The gasket material had a metal core that proved nearly impossible to cut. Some cheesy gasket punches bought for the occasion at Harbor Freight were definitely no match for it. Several of us took a crack at cutting the gasket, using every manner of cutting tool, and eventually we hacked out a crude facsimile that allowed us to proceed with the install. (Figure 1) "Real" gaskets were ordered from a turbo shop for installation later on.

To make the job easier, we removed the rear fascia and engine cover. This, along with Dave's very handy 2-post lift, gave us easy access to most of what we'd be working on, and that was well worth the little bit of time it took to do. The battery was also disconnected; a safety step that should always be taken when doing anything significant on the car. The oil was drained from the car and kept in a clean container. It would be used later for a flushing operation. The CAT and

muffler were removed, as B.A.E. provides its own muffler. Curiously, B.A.E. completely eliminates the CAT from the system. The A/C belt was also removed to get it out of harm's way.

Installation

With the power off, the engine compartment exposed, the oil drained, and the old exhaust off to the side and out of the way, it was time to start installing.

For the next step, the coolant must be drained. We saved it in clean containers for reuse later on.

B.A.E. showed some real cleverness in the way that they reuse one of the DeLorean's water hoses. The left side water pump hose gets cut, rotated on the pump outlet to reroute it over the valve cover just behind the A/C compressor, then spliced back together using a short piece of bent stainless steel pipe B.A.E. supplies. This clears the area in front of the A/C compressor for the air pipe for the turbo compressor. (Figure 2) After the hose is rerouted, the saved coolant is put back into the car. By the way, if you need to replace your spark plugs, you may want to do so prior to this plumbing exercise because once it's done, the number six plug is hard to get at.

And speaking of plugs, B.A.E. even thoughtfully supplies a new set of NGKs that are "colder" than the stock DeLorean plugs. Colder plugs make sense since under boost pressures pre-

ignition becomes more likely, and the colder plugs help prevent that. We elected not to install them however, as Marty's car – with virtually the same turbo setup – has been running just fine, thank you, on the stock plugs for several years now. Based on Marty's experience, our plan was to leave the stock plugs in place and then watch for any preignition issues, using the colder plugs only if that seemed necessary.

There are a handful of critical, i.e. "scary", operations required to install the B.A.E. kit, and one of those comes up pretty early in the job: drilling and tapping a hole in your motor! This hole serves as an oil return point for the oil that cools and lubricates the turbo. It has to be located exactly where B.A.E. instructs to avoid trouble, for inside the crankcase, not very far from where the hole needs to be drilled, is a cast-in strengthening rib. When correctly located, the edge of the hole will barely touch the rib. If you drill too far to the right, the hole will encroach on the rib making the drilling and tapping of the hole much more difficult. Also, you want to be careful to not let the drill bit run in too deep as there is a windage tray located in the crankcase just below the hole, and you don't want to damage it.

The crankcase itself is pretty thin aluminum. To successfully drill and tap it, you must be straight with the bit, otherwise tapping will be difficult. This hole-drilling business would be a snap if the motor was on a stand outside of the car, but in this case we were working



Starting to make a gasket. The gray material has a metal core and was very hard to cut.



Clever reuse of a hose.

with the motor still in the car. No standard drill and bit was short enough to fit in the space available between the frame and the target location on the crankcase, so we rented a rightangle drill from a local home center. Even with the rightangle drill, we could not quite get a perpendicular angle on that crankcase, however.

Our solution was to start with a much smaller hole, drilled as perpendicular as available space would allow, and then use a heavily-greased carbide burr to enlarge the hole to the proper diameter. The burr was much, much shorter than any regular drill bit, and we were able to maneuver it in the confined space with no problem at all. Prior to enlarging, we used a template to draw a perfect circle of the correct diameter on the crankcase. During the initial drilling, Marty held the nozzle of a shop vac close to the hole to pull shavings away and keep them out of the crankcase, and during the enlarging operation the grease on the burr captured most of the filings. (Figure 3) Afterwards, we used greased Q-tips with a rolling motion to wipe the inside of the crankcase just inside the hole to pick up any filings that did not stick to the burr. (There were many.) Had we mucked up this operation, a welding repair would have been necessary, so

there was a lot less tension when we were able to see a nice, clean, round hole, exactly where it was supposed to be.

Tapping the hole was next. The tap we had was clean and sharp, but its shank was too big to fit into the small tap handle we needed for the tight quarters we were working in. Peter, who at the time was an apprentice tool and die maker, ground the tap shank down to fit our smaller handle. He did this by eye, and ended up with the tap centered almost perfectly. Tapping fluid was used to help prevent the tap from binding in the thin aluminum. This was also a bit scary, as tapping large diameter threads in fairly thin aluminum presents lots of opportunity for screwing things up. (No pun intended.) But after a few minutes of careful turning and backing the tap, we had a nicely tapped 9/16" diameter hole, just where it was supposed to be, and we were feeling like all was well in the world. (Figure 4)

A —10 (pronounced "dash ten") male "AN" fitting supplied by B.A.E. was then screwed into the hole to serve as a point to connect the oil return line. At this point we poured some of the oil we had earlier drained from the car through the fitting, and the rest of it through the oil filler pipe to help wash any loose filings

out of the car's normal oil drain hole. We then replaced the oil drain plug.

The oil supply was hooked up next. We installed a small tee between the motor and the oil pressure sending unit. B.A.E. supplied a braided steel -4 line that we ran from the tee, then down and across the motor even with the top of the oil sump. From there it looped up again to where it would eventually connect to the turbo's center bearing housing. It was secured with cable ties in a couple of places, then just tucked out of the way until later. (Figure 5)

The "Ram's Horn" was then removed, as B.A.E. supplies a replacement piece used to connect the throttle tubes to the compressor inlet. Of course, B.A.E. was in business to make money, and to that end it seems that they cut corners wherever they could get away with it. A prime example is the required reuse of the two short metal tubes that stick out of the Ram's Horn, and which are inserted into the throttle tubes. It would have been pretty darn inexpensive to include two new tubes in the kit, but B.A.E. requires that you reuse the tubes by transferring them from the Ram's Horn to an air pipe they provide in the kit. That wouldn't be so bad if the tubes would easily unscrew from the Ram's Horn, but the guys at the Volvo engine plant made *darn sure* those tubes were not going to fall out! They were either pressed or heat shrunk into a very tight fit indeed, and that led to some moments of concern during the installation.

The instructions called for heating the aluminum Ram's Horn in an oven at 300 degrees to expand the Ram's Horn to the point where the steel tubes would loosen



Marty holds a shop vac to catch filings while Joe drills into the crankcase.



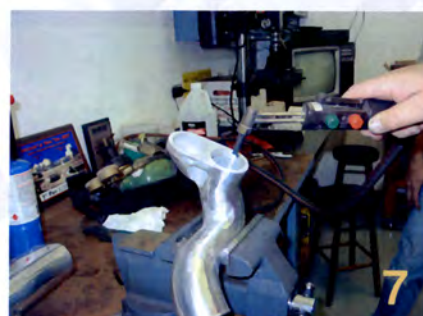
The oil supply for the turbo was obtained by means of a tee inserted between the motor and the oil pressure sending unit.



Tapping the oil return hole. Note the filings piling up in the grease on the tap.



Attempting to free the tubes from the Ram's Horn; A surprisingly difficult step.



Dennis uses a torch to persuade the B.A.E. pipe to receive the tubes from the Ram's Horn.

and fall out. Well as they say, “discretion is the better part of valor”, and Dave quickly issued a decree that we would *not* be cooking any smelly car parts in his wife’s oven! So out came the propane torch for our first attempt at getting the tubes to “fall” out. (Figure 6) Needless to say, even after substantial heating with the torch the tubes did *not* fall out, and the tension in the garage rose a little as the project ground to a halt at step number 23 of the 65 listed in the B.A.E. instruction manual. Several additional attempts were made to free the tubes, including more use of the propane torch, applying ice to the tubes after heating, yanking on them with pliers, applying penetrating oil, prayer, and even drilling a small hole in the tubes to provide a pry point and using a pick to try and pry them out, all to no avail.

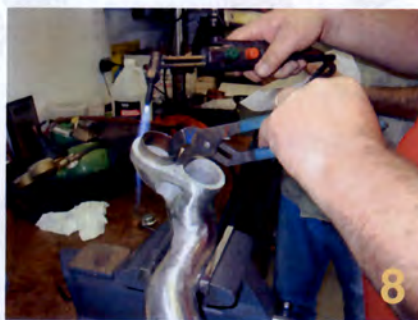
At this point, Dennis Schlieckau, who is a wizard with a torch, explained to us all about coefficients of thermal expansion, then calmly and confidently fired up Dave’s acetylene torch, and went to work. To everyone’s relief and amazement, Dennis had the tubes out in no time at all. (Figure 7)

Once free, the tubes were installed in the B.A.E. air pipe. The tubes were first chilled in the freezer to shrink them, and the B.A.E. pipe was heated to expand it. The tubes slipped easily into place, and when everything was room temperature again the tubes were held tightly captive in the B.A.E. piece. (Figure 8)

The next few operations were nothing but good, old-fashioned, wrench turning. The Turbo’s up-pipe (“B.A.E. exhaust manifold”), down-pipe, wastegate, and turbine housing were all bolted into place using high-temp gaskets and ample

amounts of anti-seize on the bolts. The wastegate comes with a small muffler that would be at home hanging off a Briggs and Stratton lawn mower engine. When the wastegate relieves exhaust pressure, the excess is discharged through this muffler directly onto the down-pipe. It would have been nice if B.A.E. had chosen to connect the wastegate’s output back into the main exhaust between the turbine and muffler, instead of just having it vent inside the engine compartment, and perhaps someday we’ll make that mod ourselves. The wastegate operates off of a manifold vacuum/boost signal transmitted to it via a -4 braided steel line connected to the driver’s side intake runner. (Figure 9)

The “snail” (the turbo’s center bearing section and compressor section) was now mated to the turbine housing and secured using a special V-band clamp that squeezes it tightly against the machined mating surface of the turbine housing. It’s important to torque the clamp properly. Leave it too loose and you will have an exhaust leak, but get it too tight and the turbine will not even turn. The directions tell you how to do this, but it is a good idea to give the compressor blades a spin with your fingers after tightening the clamp to make sure all seems well before moving on. (Figure 10)



Dennis slips the tube into place.



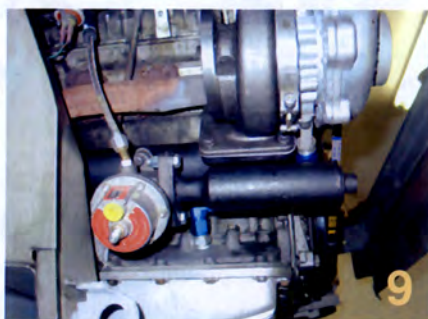
Attaching the snail to the turbine housing with the v-band clamp. It is important to properly torque the v-band.



Grinding down the tubes to compensate for the incorrect hole spacing in the B.A. E. pipe.

At this point, the free end of the oil supply line was connected to the center bearing section and tightened down. A short -10 oil drain line was connected between the turbo’s drain spout and the crankcase fitting we installed earlier.

All of the air pipes and the discharge plenum went on next. The first problem we ran into was that the holes in the B.A.E. air pipe were on slightly different centers than the holes in the throttle tube. The result was that the tubes we worked so hard to transfer to it simply would not go into the throttle tubes! After making a few measurements with a digital caliper, we knew that the holes on the B.A.E. piece were too far apart. The answer to this dilemma was to use a Dremel tool to lightly grind down the outer edges of the tubes until they would fit into the throttle tubes. This was just one of a handful of cases where parts supplied by B.A.E. were made to incorrect tolerances. (Figure 11) It was also necessary to cut off one end of the throttle mounting bracket to provide clearance for the pipe. Again, the Dremel was the right tool for the job. (Figure 12)



The small muffler on the wastegate is just below the turbo. Visible behind the muffler is the blue AN fitting returning oil to the crankcase. The wastegate is the gray and red object to the left of the muffler. The braided steel line going to the wastegate carries the manifold vacuum/boost signal to the wastegate.



This bracket needed to be cut off to provide clearance for one of B.A.E.’s air pipes.

The plenum that B.A.E. supplies to connect to the intake runners was not exactly a precision piece of work either. The plenum's flanges that bolt up to the intake runners were fairly coarse and heavily grooved on their mating surfaces, almost like they had been rough sawed off of a larger extrusion. Before assembling the plenum to the intake runners, we sanded the flanges flatter and smoother using a sanding block and fine sandpaper. (Well what do you expect? Dave's shop is very well equipped, but even he doesn't have a Bridgeport... yet!) New paper gaskets coated with Hylomar were used to seal these joints. (Figure 13)

A little more wrenching, and the down-pipe, muffler, and tail pipe were installed. The muffler is wider than the stock unit, and it leaves no room for the original heat shield. B.A.E.'s answer was to equip the muffler with an integral heat shield. They simply welded a retainer of corrugated metal on top of a sheet of asbestos to the inner face of the muffler case. I called this contraption the "mustard plaster from hell". (Figure 14)

Only the passenger side tail pipe is live, by the way. The one on the driver's side is a dummy that gets welded onto the down-pipe after everything else is in place. It does *look* good though! (Figure 15)

One of the trickier operations was "recurving" the distributor. When boosting a car, it's necessary to limit total spark advance to prevent detonation. The procedure calls for removing the distributor and using a "distributor bench" to make the adjustment. That would have been easy, IF it was 1985 and there were still lots of repair shops around with distributor benches. But



Mounting the B.A.E. plenum to the intake runners.

now that almost every car made has electronic spark control, it was hard to find a shop where the mechanics even knew what a distributor bench was! We live very near Chicago where generally speaking you can find almost anything you're looking for, but it literally took days of calling around to locate just two shops that had machines. One of those was a speed shop that kept it for recurring muscle cars from the 60's and 70's, and the other was an old-time mechanic who had one at his house. In the end, we decided to do the job without a bench. B.A.E. suggested using a punch and hammer to bend one of the mechanical advance weight stops inside the distributor to prevent any movement of that weight at all. We used a different approach which was to drill and tap the weight stop to receive a 2-56 set screw which we ran in to limit the weight's travel to about half of normal. Thread locker was used to keep the set screw in place. When the car was back together again and restarted, we used a timing light to measure total advance. Surprisingly, we hit it about right. Fine adjustments may be made the next time we have a good reason to remove the distributor.

Remembering that the turbo is nothing but an air pump, you might be wondering about fuel delivery. The Bosch K-Jetronic (with lambda) system has enough overhead capacity to keep up with increased air flow up to an output of roughly 200 horsepower. So nothing



B.A.E. muffler installed. Note the lack of room for the stock heat shield. The B.A.E. muffler uses an integral "mustard plaster" heat shield.

too special needs to be done to keep the engine from leaning out. But under boost conditions, when the driver has called for more power, what you really want is a slightly rich condition.

The ECU will normally attempt to maintain a "normal" air fuel mix except during wide open throttle operation. When the throttle is wide open, or if it sees an extremely lean indication from the lambda sensor, it uses the frequency valve to enrich the mixture. B.A.E. used a pressure-sensing switch mounted on the driver's side intake runner to short out the lambda sensor at boost pressures of roughly .5 to 1 psi. On seeing the output of the lambda sensor drop to 0 volts, the ECU adjusts the duty cycle of the frequency valve to what is known as the "rich stop", or about 95% duty cycle. This is all the ECU can do to make the car run richer.

The pressure sensitive switch that came with the B.A.E. kit was a fragile-looking contraption. It would have been a perfect choice for a Yugo turbo conversion, but we decided not to use it. Instead we bought a much more rugged equivalent known as a "Hobbs" switch from a local NAPA store. To ensure it was working and adjusted properly, we bench tested it prior to installation. A pressure gauge was connected to the switch and we gradually increased and decreased the air pressure above and below 1 psi while monitoring the switch contacts with an ohmmeter. (Figure 16) We adjusted the Hobbs switch to close



View of new exhaust tips. Only the right pipe is live - the left Ceramic-coated Dynomax muffler is visible just below bumper drain line is visible to the left of the muffler.

its contacts at .5 psi of boost. The switch was then mounted to the front of the driver's side intake runner, using a small brass tee and wired up to short out the lambda sensor. (Figure 17)

Finally, the motor was given a new oil filter and a fresh fill of nice, clean, 15W-50 Mobil-1 synthetic oil. (Mmmm... Good!) Before starting the car, we had to ensure that the turbo, which had spent its last 20-odd years in a box waiting for a chance to go to work, was well oiled. To do this we disconnected the hose from the turbo's oil drain and placed a small container under the open drain. Then we disabled the fuel pump by pulling up the plunger on the inertia switch, disabled the ignition by pulling the high-tension wire off of the coil tower, and cranked the motor until we saw oil dripping from the drain. At that point, we reconnected the drain hose and ignition wire, reset the inertia switch, and started her up! Initial timing was set, and then it was time to hit the local back roads for some testing and adjustment.

Testing and Adjustment

With the turbo finally installed and the car running again, it was time to make some test runs and set the boost level. After almost 4 days of work to get the turbo installed, and with the weekend drawing to a close, we decided we didn't have the time to permanently install a boost gauge for these test-drives. So with the engine cover still off the car, we connected the vacuum tubing for the boost gauge to the threaded port at the rear of the passenger side intake runner, and in the finest tradition of shade tree mechanics everywhere, we *duct-taped* the boost gauge to the rear window so it could be seen in the rearview mirror! (Figure 18)



Marty tests the Hobbs switch with a pressure gauge prior to installation.

Boost adjustment is by means of an Allen-head socket screw on the wastegate that gets locked down with a hex nut. Clockwise adjustment of the screw increases boost. Adjustments need to be made cautiously in small increments. Absolute maximum safe boost for an otherwise unmodified DeLorean motor is about 7 psi. An over-boosted engine can blow suddenly, and exceeding that limit risks sudden and severe engine damage.

With a fire extinguisher in the car, and another in the "chase" car, we started out with the wastegate turned to minimum boost and hit the road, returning frequently to Dave's garage to give the adjusting screw half-turn adjustments before heading out once again. This process was repeated until under heavy acceleration we saw roughly 3 pounds of boost, at which point we stopped making adjustments.

The first few test and adjustment runs went without a hitch, but I drove the chase car for some of these adjustment sessions, and was the first to notice a growing trail of white smoke coming from the tail pipe. A quick cell phone call to the DeLorean, which was starting to resemble a crop duster, brought a halt to the test run and a return to Dave's garage for some debugging.

Troubleshooting

The B.A.E. instructions explain how to install a turbo, but it was during troubleshooting of the oil leak that we came to really understand how turbos *work*, both in theory and practice.

First, we disassembled the air pipes on the turbo and found that the air pipes that



The cylindrical brass object is the Hobbs switch mounted on the intake runner. Under boost, it shorts out the lambda sensor to cause the ECU to enrich the mixture.

led from the compressor to the intake were heavily coated in oil. Looking down into the compressor housing we saw that it was literally half full of oil. Later on Peter would dub this pool of oil "Lake Mobil". When spinning, the compressor wheel would throw this oil in a heavy mist right into the intake where it would burn and create lots of smoke.

Next we disassembled the turbo to examine its internals to see if there was anything obviously wrong. Nothing was terribly obvious; in fact the turbo looked pristine inside. (Figure 19)

I went to the internet to research causes of turbo oil leaks. I found a turbocharger troubleshooting chart. There are several out there, and most are about the same. As always, check the simple things first. The simplest cause of compressor side oil leaks in turbos is a dirty air filter. What happens is a dirty air filter results in a greater vacuum being created in the compressor housing. With oil pressure of perhaps 50 psi or more on one side of the seal, and a vacuum of perhaps 22 inches on the other, the oil can be "vacuumed" right through the small clearances in the seal. In fact, some of this always happens even in a properly operating system, but it is normally so small as to go unnoticed. When the air



Boost gauge duct taped to rear window... Flux capacitor fluxing... Let's go!



The disassembled turbo.

filter gets clogged, the engine “pulls” harder to bring in air. The vacuum increases and oil transmission across the seal goes up as well. The result can be smoke in the exhaust.

A quick check of our air filter showed that it was indeed dirty. A replacement was ordered and installed, but there was no improvement.

We followed each and every cause of oil leaks listed in the troubleshooting chart, and came up empty. The process literally took months.

At one point we substituted a piece of clear hose for the steel braided oil drain line so we could observe how the oil drained. We could see that instead of a quick efficient draining away of the oil from the bearing housing, the drain line would eventually back up and the oil would then “glug” as large air bubbles worked their way up the hose from the crankcase to the turbo oil drain. This did not look good at all.

The B.A.E. design mounts the turbocharger so low that the oil drain line must run nearly horizontally to get oil back to the crankcase. The problem with this is that the seals in a turbo are principally designed to seal gases - not oil. If they are kept submerged in oil by a poorly oriented drain system, the likelihood of oil leakage into the exhaust, intake, or both are greatly increased.

Conventional turbo system design dictates that the drain be set as vertical as possible. Rajay’s own installation instructions specify that the drain be no more than 45 degrees from vertical. In what must have been another cost-saving simplification, B.A.E. ignored this generally accepted principle and went with a horizontal drain orientation that virtually guarantees that the seals will be fully submerged in oil whenever the car is running.

We tried a few “Band Aid” approaches to improving the oil drain, including reaming out the inside of the fittings to maximize their bores, but none of those efforts improved things very much, so

we decided to rework B.A.E.’s horizontal drain system.

Luckily, the Rajay turbo is designed to allow easily orienting the drain in any of 12 different positions. This required partial disassembly of the turbo, but was very straightforward and easy, and we soon had the drain spout pointing almost straight down, just like it’s supposed to.

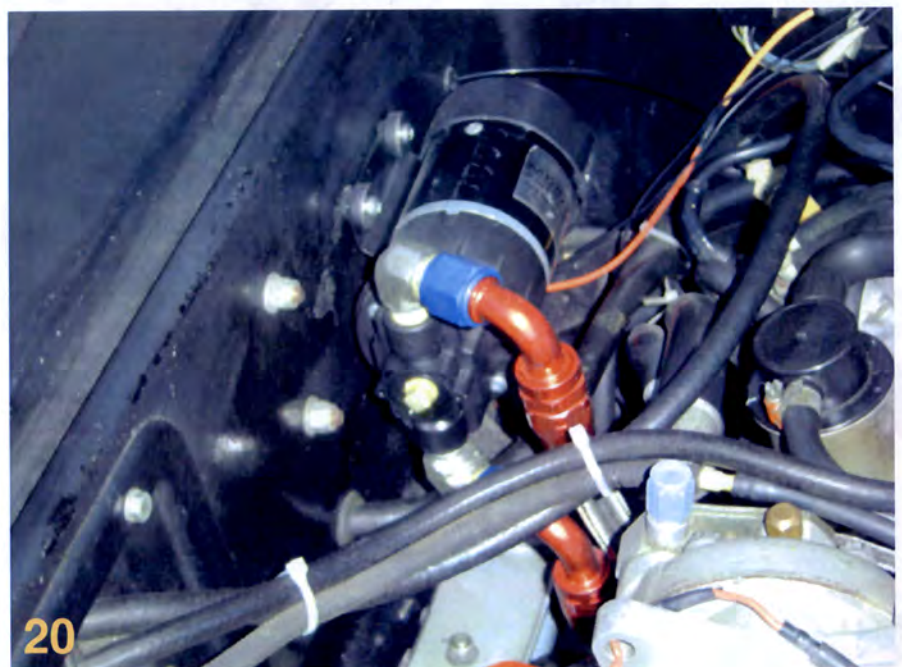
We located a suitable oil scavenge pump; an electrically-operated unit made by Mocal Oil Control Systems. It’s self-priming, which means it can be mounted above the turbo. We mounted it on the driver’s side pontoon, and connected it to the turbo and crankcase using -10 steel-braided lines and fittings from Aeroquip. The drain hose from the turbo was routed so as to form a slight curve below the turbo before going back up to the inlet of the pump, thus forming a small “sump” for the oil. A Bosch-style relay applies 12 volts to the pump whenever the ignition is on. (Figure 20)

We cleaned the oil out of the air pipes using brake cleaner and dried them with shop towels and compressed air. Spark plugs, fouled with oil from previous runs, were also changed. “Lake Mobil” was drained for the umpteenth time, and everything was put back together. This new scavenge pump setup would

virtually suck the oil right out of the turbo drain and dump it back into the crankcase. If the cause of the oil leakage was that the seals were good but being asked to do the impossible by virtue of being continuously under oil, this would solve it!

Another test run showed some minor reduction in smoke, but the problem was still very much there, and very much in need of a better solution.

It was around this time that Peter and I began thinking that turbos don’t actually blow, they just suck! We were both tired of fighting the oil leakage problem, and just wanted what had turned into a nightmare to end, one way or another. In a burst of frustration, Peter went to the garage one night and began removing the turbo. Personally, I felt that in our extensive troubleshooting, we had eliminated almost all of the common causes of oil burning problems, which to me suggested that whatever was causing it was something small and probably cheap to fix. I could see and understand Peter’s frustration however, and felt that if he had gone as far as he could with the project, I wasn’t going to push or drag him any further. But I personally wasn’t quite ready to give up the fight, and wanted to see all of the time, effort, and money that had already



The oil scavenge pump mounted on the driver’s side pontoon.

been spent come to a good result.

Now even though this turbo was “new” in the sense that it had never before been installed and run, it was still over 20 years old, and I began to think about what parts might have “aged” in those years. The compressor seal, which has a spring washer to provide thrust, came to mind. Seals in turbos are primarily gas seals. Preventing oil leakage is a very important, but slightly secondary function. I had heard of numerous other turbo owners whose setups started leaking oil and blowing smoke. To try to fix that issue, most of these folks either had their turbos completely rebuilt by turbo shops, or attempted the operation themselves. In almost every instance the oil-burning problem remained. Still, we had looked at almost everything else, so there was little to lose by trying a new compressor seal.

A new seal assembly was ordered. When it arrived, the old one was removed. With both assemblies standing next to each other on a table top, it was clear that the old seal was about 25% shorter than the new one. It also felt much weaker than the new one when compressed between finger and thumb. Ah-ha! After more than 20 years of being in a compressed state in the “new” turbo, the spring washer had lost some

tension and height. It hadn’t worn out from friction; it had worn out from age! It was quite encouraging to find this difference in height and force since the spring washer provides the thrust that holds an O-ring against the compressor plate, thus forming an oil seal. If the washer was weak and short, maybe there wasn’t enough force to make a good seal. This really looked promising, and it was with some real confidence that the turbo was reassembled with the new seal and then reinstalled on the car.

But yet again we were met with disappointment. The leakage seemed reduced, but there was still far too much oil leaking into the compressor, and our hopes sank once again.

One other potential problem was noticed when the seal was being changed though. There was a small “nick” in the compressor plate right where the o-ring of the compressor seal assembly needed to seat. This nick may have been a chip, or it may have been a casting defect. It was small, but it ran radially from the edge of the compressor shaft hole, and it could potentially channel oil under the o-ring and into the compressor housing. (Figure 21) In fact, Marty and I had noticed that chip earlier when we had disassembled the turbo while looking for the elusive oil leak. We examined it

closely, but couldn’t tell if it would be a problem or not. It looked harmless enough at the time, and with no spare compressor plate, we just put the unit back together. But now, with all other ideas exhausted, that chip alone remained as the only unexplored possible cause of leakage. The plate looked expensive, and I just assumed it wasn’t even available anymore. I was thinking of having it welded and refaced, but before going to that extreme I wanted to be sure this was likely to bear fruit. I began a search for a true expert on turbos, who could render an informed judgment as to whether or not that would really solve the problem.

My search led me to John Craig, at Limit Engineering in Lake Havasu City, Arizona. I’d seen John referred to by a poster in an internet newsgroup as a real expert on turbos. Another quick internet search then led me to Limit Engineering’s web site and a phone number.

John and I had a pleasant conversation. In a brief talk I learned quite a bit about the history and workings of Rajay 300 series turbos from John, who at one time worked for Rotomaster. (Rotomaster once owned the automotive part of Rajay’s operations.) It was obvious I had found the “real” expert I needed to lead me to the promised land of smokeless turbos. He asked me to send him the compressor plate with the seal assembly still in it. A few days later, John called me and said, “That nick is definitely your problem.” John must have been sympathetic to my plight because without charge he transferred the new seal from the plate we sent him to one of several Rajay plates he had and sent it back again.

I refused to get too excited, as Peter and I were both emotionally exhausted from this whole experience, and so many times before we thought we had found the problem only to be frustrated in the end, but this was indeed our last shot. So back on the car it went.

We started it up, and... smoke!

(continued on page 47)



21 View of the inside face of the compressor plate with the seal assembly removed showing a small chip near edge of the center hole. That small defect, hidden *inside* the turbo and *under* the seal, was the cause of a massive oil leak and much smoking! It took months to track down the cause.

See Out the Back, Jack...

(rear camera and new radio)

SUBJECTS IN MONITOR ARE CLOSER THAN THEY APPEAR

By: Dominique Flandin

I decided to install a rear camera (**bottom left photo**) and a monitor on the dashboard (**background**) to improve the rear visibility of the DeLorean. The rear camera is small enough to install between the exhaust system. (**bottom right photo**) Of course, the camera is waterproof and shock resistant.

You can power on the monitor all the time, or it turns on automatically when you back up. An advantage to leaving the monitor on all the time, is you can easily see every car on the right or left. So, we can say that this improves the security of both the car and yourself.

When you are in the parking lot, it's easy to see if someone is behind the car, or even something like a dog or a cat. On the screen there are some points to tell you the distance between the camera and the wall for example. Unfortunately, it's not very useful because you must install the camera to a certain height. Like in our case, the camera is lower to the ground, so you can't trust this point.

Nevertheless, I don't regret this upgrade at all. My installation is in black & white, but you can find the new model in colour with a very thin monitor. My own monitor is a little too big for my taste, I have in mind to change it for a new one in the future.



...Just Listen to Me



Like many other DeLorean owners, I have decided after a while to take the Craig radio out, because, in my opinion, this radio wasn't nice enough to be in such a car. Besides, as I am living in France, I had a few problems with receiving the radio channels. With the original speakers, it's true that the sound wasn't very good.

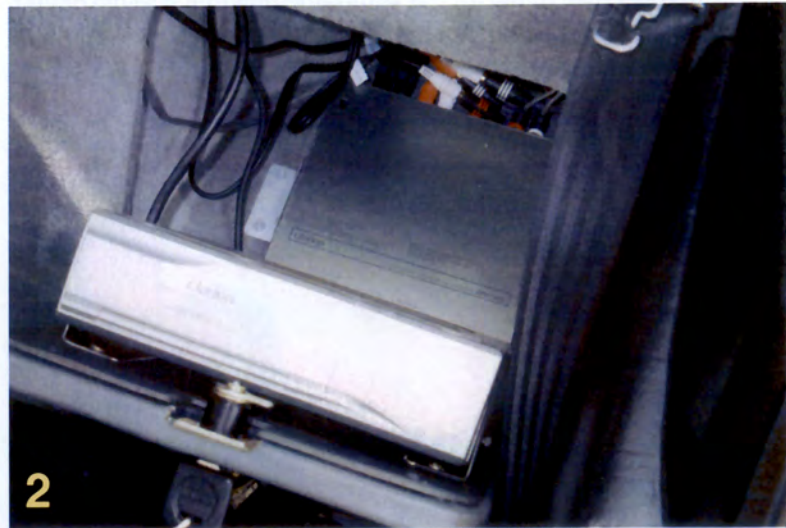
So, I had to find a good radio, not only one that sounds good, but one that also looks good. Most of the radios available on the market were not very cool, but I have found my happiness with Clarion's radio. **(photo above)** This one was nice enough for my taste, and had a great possibility.

This radio doesn't have speaker output - you must use one or several amplifiers to hear the music. I bought several items separately to connect to the main unit. First, I purchased three power amplifiers; one for the front speakers, one for the side speakers that are mounted in the original place, and one more for the bigger speakers that were added to the rear parcel shelf. **(photo 1)**



The equipment is also very good. I have a CD player and a DSP processor located behind the driver's seat. **(photo 2)**

There are two remote controls; one of these is for the passenger, and the other one is mounted on the steering column. **(photo 3)** This way, it's not dangerous at all to change channels, switch to the CD, and of course, control the DSP.



With the DSP processor, you can recreate different locations of the sound, such as a stadium or a church. The possibilities of this processor is really great.

For the installation, I had to do a few modifications on the rear parcel shelf because the speakers were too big. I started to open all the boxes that were on my hood. **(photo 4)**



I made a new panel for the speakers; one that's a little bigger than the original, but not too much, to keep the original image of the car. **(photo 5)**



The most difficult part was to connect every wire in a good way. **(photo 6)** If a short circuit happens it could be dangerous for all the electronic components. Patience is the key to succeed. Once everything works together, the sound is very nice, and the blue light of the radio makes the dashboard really nice. ~🚗



A CLUB FOR DeLOREAN OWNERS AND ENTHUSIASTS

DE LOREAN MIDWEST CONNECTION

TECH SESSIONS • SOCIAL EVENTS • AND MORE!

Our DeLorean Club operates around the northern part of Illinois. The Club also has members from surrounding regions such as:

- Southern Wisconsin
- Eastern Iowa
- NW Indiana
- Minnesota
- North Dakota
- SW Michigan

Membership
Only \$25.00
per calendar year

For more information or to join, contact

Don Gowler

c/o DeLorean Midwest Connection

4831 Deepwood Lane

Palatine, IL 60067

dongowler@comcast.net

DESTROY THE DECAY



Replace those cracked and worn out seat covers!

DMC has recently received newly remanufactured seat covers in both black and grey. The new seat covers have been specially manufactured to match the exact grain of the leather and vinyl of the original seat covers. These covers are made of high quality leather and will give your DeLorean interior that new car appeal!

NEW! Seat Covers – Price per Seat

- K116602 – Black \$399
- K116003 – Grey \$399

NEW! Seat Covers – Price per Set

- K116600 – Black \$599
- K116601 – Grey \$599

NEW! Seat Covers Mounted on New Seats

• Price per Seat

(No backs, no tracks, no release bars – sold separately, or use your own)

- 100600 – Black RH – \$699
- 100601 – Black LH – \$699
- 110516 – Grey RH – \$699
- 110517 – Grey LH – \$699

NEW! Seat Covers Mounted on New Seats

• Price per Pair

(No backs, no tracks, no release bars – sold separately, or use your own)

- 100602 – Black – \$1199
- 110518 – Grey – \$1199

DeLorean Motor Company • 15023 Eddie Drive • Humble, TX 77396 USA
800/USA-DMC1 Toll-free • 281/441-2537 Voice • 281/441-2813 Fax
Visit our online store at www.delorean.com

"That's it," I thought, but said, "Let it run for a few minutes." In a minute or two, the oil residue that was in the system had burned off, and the car was running pure, sweet, and clean. No smoke whatsoever. We could hardly believe it.

John's help ended months of aggravation. In the eleventh hour, just before giving up, the answer was at hand and the nightmare was *finally* over!

The new, and improved, driving experience

I asked Peter for some comments about how the turbo changed the driving experience. He said, "Just have one page with nothing but a big smiley face on it." That says it far better than anything I could ever say. The turbo completely redresses any performance issues that plague the normally aspirated DeLorean.

After we adjusted the wastegate to limit the turbo's production to about 4.5 psi of boost, Peter took a test drive and came back with a very wide smile on his face. "Holy cow, that's more fun than the Camaro!"

He insisted I drive the car and "get into it" a little so that I could understand his excitement. I wound it out in a couple of gears, and it was clear that the car was really happy to run. In fact, the harder I pressed it, the more it wanted to go. The sensation was much like the sure and steady power increase you feel in a plane on a take off run.

So now the "D" is not only fun to be seen in, it's fun to *drive*. And *that* is one very cool new trick!

But wait, there's more...

The basic kit as designed by B.A.E. and installed according to their instructions works well enough, but what true gear head ever leaves well enough alone?

One problem with the original B.A.E. kit is that the turbo is mounted close to the frame and the high heat radiated by the turbo will eventually discolor, and even burn off the nearby epoxy frame

coating. Our answer to that was to send the turbine housing, up-pipe, down-pipe, and exhaust manifolds to High Performance Coatings (HPC) in Utah for ceramic coating. HPC applied a special black, 2000 degree, "HiperCoat Extreme" ceramic to the turbine, up-pipe, and down-pipe, and a 1300 degree chrome-look ceramic coating to the exhaust manifolds. The result was greatly improved appearance, with enhanced corrosion protection and no worries about burning the epoxy off the frame. There's a performance benefit as well. Keeping the heat inside the exhaust system delivers greater energy to the turbine for faster spin-up (that is, it reduces "turbo lag"), and it keeps the under-hood temps down.

The B.A.E.-supplied muffler is a basic garden-variety, galvanized steel unit with a welded-on heat shield. It's functional, and it sounds okay, but it certainly isn't going to win any beauty contests. The solution was to replace it with a highly-polished stainless steel muffler from Dynomax that has much better looks and a sound that better matches the DeLorean's character and heritage. But the Dynomax has no integral heat shield, and neither it, nor any other stock mufflers with inlets and outlets sized to match the rest of the B.A.E. exhaust system leaves enough room for a separate heat shield. Once again, HPC

provided a solution by applying a ceramic coating to the entire muffler. While the coating isn't as brilliant as the super bright polish of the uncoated muffler, it still looks great, and is so effective that you can run the car to full operating temperature and then place (and keep) your hand directly on the muffler body without being burned!

The B.A.E. kit completely eliminates the catalytic converter, probably because there just isn't room to squeeze in a stock CAT and muffler, and a custom CAT and muffler arrangement probably would have added too much to the kit's price. To ensure passing emissions tests, we had a local exhaust shop install a flange joint between the down-pipe and the muffler. The flange joint allows for quick and easy substitution of a CAT for the muffler on emissions test day. Although, to our pleasant surprise, a check with an A/F meter at our neighborhood corner garage shows that the car will pass Illinois emissions tests even without a CAT!

One of several side effects of the higher cylinder pressures encountered in boosted cars is that it becomes much more difficult for the spark plugs to fire. To counter this effect, the stock Bosch ignition coil was replaced with an Accel "Super Stock" coil. (Figure 22) This is an exact fit for the stock coil, but pro-



Accel "Super Stock" coil.

duces a much higher voltage. The stock wires were retained to carry the juice.

Since this car is driven only in the summer, we replaced the heat-stove and air shutter with a short, straight-through piece of 3" aluminum flex-pipe bought in the heating and air conditioning department of our local Menard's home center. The plastic elbow that normally fits into the passenger side pontoon was instead installed on the engine end of the flex pipe and snapped into the inlet of the air box. The other end of the flex-pipe was simply bent to align with the hole in the pontoon and pushed into the hole. (Figure 23) It's simple, but does a nice job of bringing fresh cold air to the engine.

Finally, for appearance sake, we polished the compressor housing using a Dremel tool and some polishing compound.

Driving and Maintenance Habits

A turbo is essentially pretty simple, but they do have their finer points and there are a few habits you must develop if you hope to get years of trouble-free service. A turbo spins very fast and gets very hot. Speeds of up to 100,000 rpm are not unheard of, nor are turbine temps of 1300 degrees! Under such demanding conditions, the bearings absolutely *must* have a continuous supply of clean oil to

keep them cool and well lubricated. In the Rajay turbo, the bearings are of a special "floating" oil-film design. If that film of oil should fail, even briefly, disaster is probably just seconds away!

With that in mind, when a turbo car is first started, it is important to let it idle long enough to ensure that oil pressure has been established and oil is flowing through the turbo bearing section before any hard driving takes place. Likewise, after a drive, it's always a good practice to let the car idle a few minutes before turning the engine off. This allows the turbo's shaft to slow and its bearings to be cooled down by engine oil before the oil flow is interrupted. (Shut the car off, and the flow of oil over the turbo bearings stops immediately.) Failure to follow this practice can result in the oil "coking" in the turbo bearings. That is, the oil literally gets turned into ash by the heat of the turbo if the bearings are not allowed to cool before shut down. This condition will lead to rapid failure of the bearings due to the inherent abrasiveness of the ash, and may even result in a clogged oil supply line. Some turbo system designs incorporate a "turbo timer" that automatically runs the motor for a few minutes after you remove the ignition key. But in the 1980s, when performance-hungry DeLorean owners were bolting B.A.E. kits to their cars, the driver had to make a habit of letting his

machine cool down before turning it off.

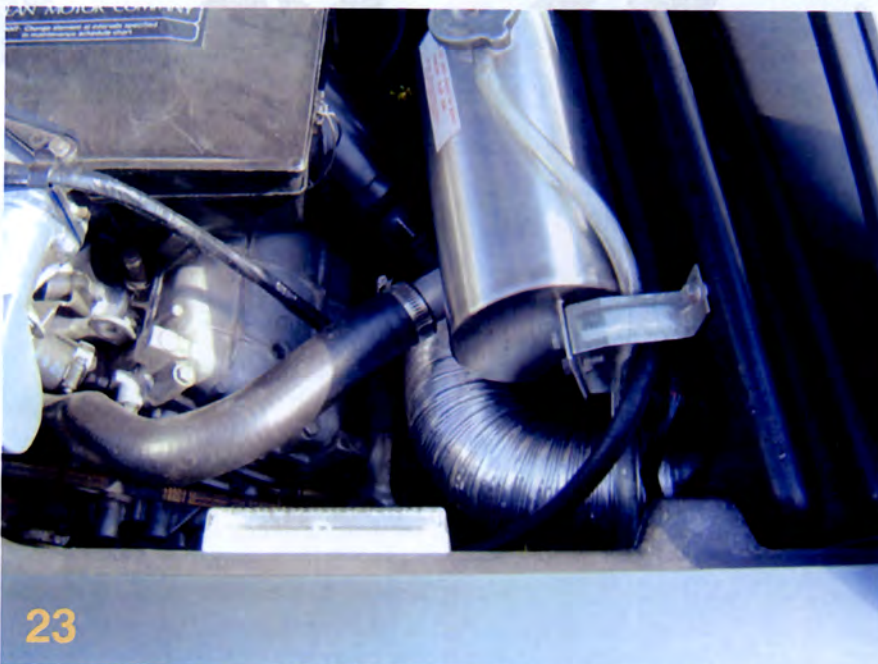
Using the proper oil and keeping it very clean is critical. Only synthetic oils have the heat resistance to safely stand up to the harsh conditions in a turbo. Since bearing tolerances are close in a turbo, dirty oil will cause wear that can lead to early and costly failure. Use of good quality oil filters along with frequent oil changes helps protect your investment. Peter uses Purflux filters and 15W-50 Mobil-1 synthetic oil, both changed at regular intervals.

Turbochargers can substantially increase cylinder pressures, and only high-octane premium fuel should be used. Use of low-octane fuel might cause detonation that could destroy the motor in a number of interesting ways. Most DeLorean owners already use at least mid-grade gas, but if you install a turbo, don't even think about using anything but the best available premium fuel.

The Future

On his own car, Marty drilled and tapped a hole on the driver's side of the motor to connect the oil supply line to. This hole is in a boss on the motor directly opposite where the oil-pressure sending unit is on the passenger side. The result was a very neat and short direct run to the turbo, as opposed to the unsightly long line that runs all the way from the oil pressure sender to the turbo. (The longer line simplified installation by requiring one less drilling and tapping operation, but it just doesn't look good.) That mod will be a winter project for Peter's car.

Also planned is a dyno testing and tuning session to adjust the maximum boost while we watch for signs of excessive lean-out and/or detonation. Other than the Hobbs switch that tricks the ECU into running the frequency valve at the "rich stop" (95% duty cycle, or maximum enrichment), B.A.E. made no other provisions for additional enrichment under boost. Instead, B.A.E. relies on the K-Jet's inherent overhead capacity to flow enough fuel for a moderately boosted car. If dyno testing indicates



New cold air intake bought at Menard's Home Center.

lean-out issues under higher levels boost, we will be devising ways to provide extra enrichment by dropping the control pressure on an as-needed basis.

A turbo motor has increased power, but part of the price for that power is a higher heat load on the engine. The cooling system on Peter's car seems to be in pretty good shape, but if it ever becomes necessary to replace the radiator, a three-row radiator which has more cooling capacity than the stock unit will be used to help keep things cool.

It's important to know right away if anything has gone wrong in the turbo that might result in poor performance or cause damage to the turbo or the engine. The most basic way to monitor operation is to permanently install a boost gauge where it can be read from the driver's seat, and this will definitely be done very soon. After a boost gauge, the most helpful indicator is an air/fuel meter. Remember that a turbo only drives more air into the motor, so unless fuel flow is also increased, the motor will run lean and harmful detonation can occur. Cylinder pressures rise dramatically when detonation happens, and left unchecked will quickly destroy the engine. An air/fuel meter allows the driver to see when the engine is leaning out. In the future, an air/fuel meter may be installed.

Summary

B.A.E. made a few concessions in favor of a lower price and easier installation, but these amounted to little more than annoyances and the kit went in without any serious problems. The deeply hidden defect inside the turbo itself resulted in much frustrating time spent troubleshooting, but that was a very unusual and isolated problem, and B.A.E. can hardly be blamed for it. (I'm not sure the same can be said for Rajay's quality control in the early '80s though.)

The kit certainly was not cheap, but the performance increase was phenomenal and the car is so much more fun to drive. It was also pretty cool to be installing a kit that was about 20 years old, but still "brand new".

By the way, this car will be at Pigeon Forge in June, so be sure to stop by and have a closer look! ~ 🚗



Bird's-eye view of the completed project.

Credits

Peter and I would like to thank:

- Marty Maier, the heart of the install team, who traveled all the way from the St. Louis area to spend three very solid days helping us install the system and get it working. His willingness to help a couple of (then) complete strangers with this project is representative of the very best values in the DeLorean owner's community.

- Dave Swingle, for his more than generous donation of knowledge, time, tools, encouragement, and garage space; without which we could neither have started nor finished this project. He frequently kept things moving forward with just the right idea at just the right time.

- Ron Wester, publisher of "Gullwing", whose good humor kept us all loose, and whose omnipresent camera kept us motivated to get the damn job done.

- Dennis Schlieckau, whose knowledge of metallurgy, and "flare" with a torch got us over the hump at a critical juncture.

- John Craig at Limit Engineering, whose masterful knowledge of all things turbo allowed us to finally stop the smoke! (Limit Engineering's web site is at <http://www.limitengineering.com>).

- Dave's wife Julie, for letting Dave come out and play well past his normal bedtime.

- My wife Irene, for letting me stay up past my bedtime to go over to Dave's house and play with the rest of the guys.

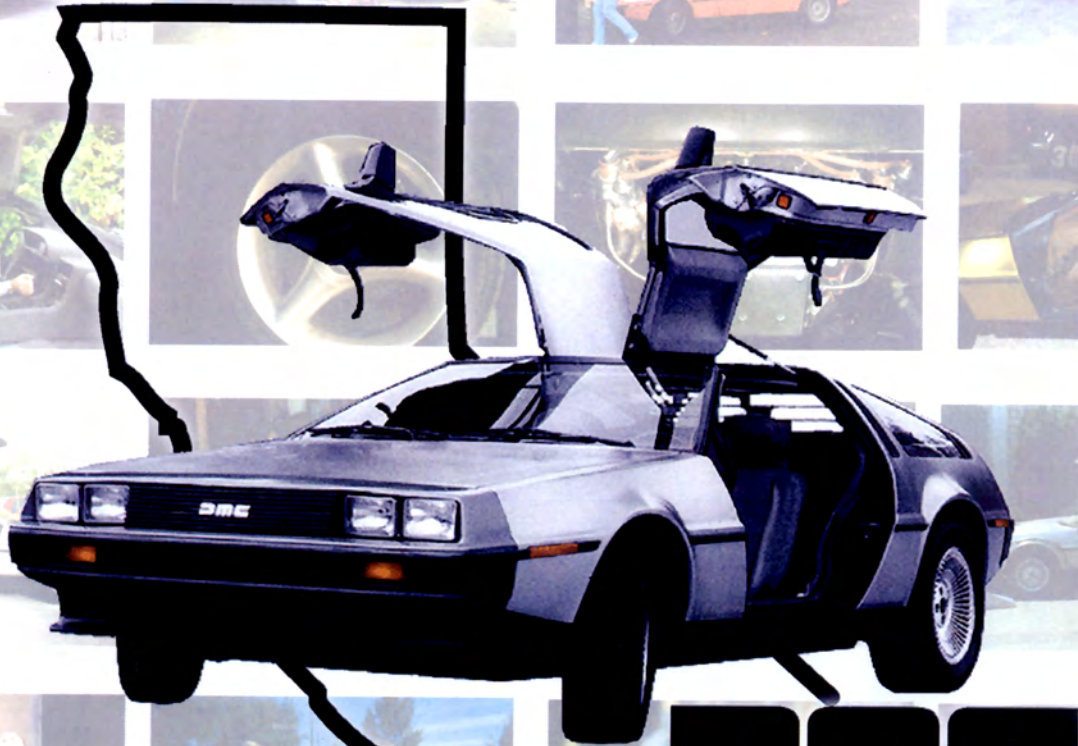
- My nephew Chris Kohunsky, who would much rather have been turning wrenches with us, but who instead spent the year in Iraq in the service of his country. Also, all the other fine men and women, including Chris' brother Jeff, and my wife's cousin Jay, who are now serving their country by facing danger in far away places, so that folks like us can enjoy working, living, and playing safely here at home.



Peter with his car, looking very pleased with the end result.

DeLorean Motor Center

Service Begins with the Customer.



DMC

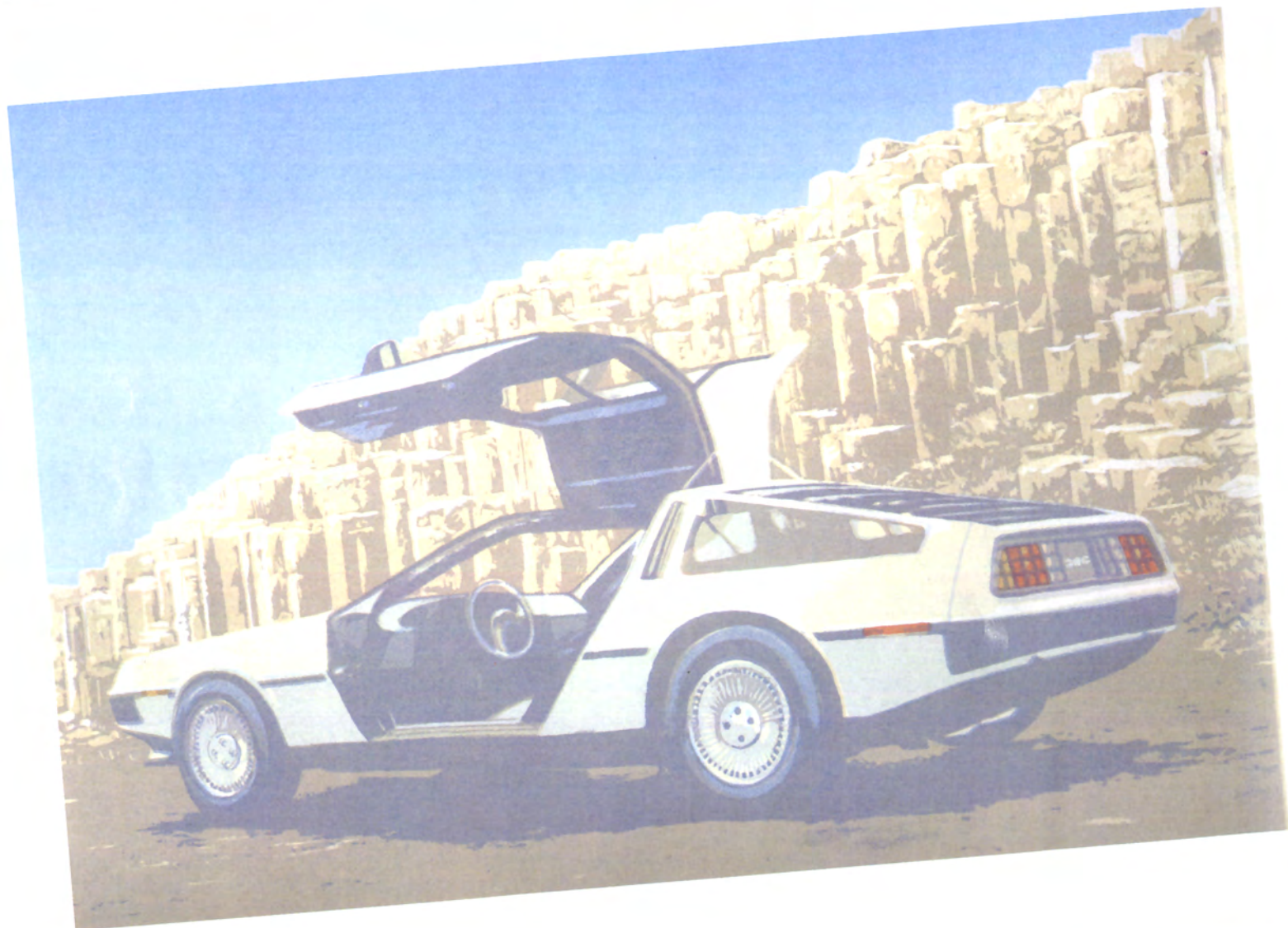
714 554 6794 Days 714 520 5670 Evenings 714 554 0163 FAX
www.deloreanmotorcenter.com

13881 West Street, Garden Grove, California 92843



If you missed it at Eurofest 2001... don't worry.

If you didn't win it at the Houston Concours 2003... don't worry.



This Special Edition ORIGINAL SCREEN-PRINT is now available for a limited time. Since only 40 of these prints exist, quantities are limited. Each print is numbered and signed by the artist Debra Wenlock. The print area itself measures 8 X 11.5 inches with the overall canvas size measuring 12.5 X 18 inches. Add this unique piece of artwork to your DeLorean collection today! To order, send check or money order for \$150.00 to Gullwing Magazine, P.O. Box 991, St. Peters, MO 63376 or transfer funds via www.PayPal.com to gullwingmagazine@juno.com. Price includes shipping and insurance.